OMC 8000

ORBIT MERRET PLC SYSTEM
- MAIN MODULE

SAFETY INSTRUCTIONS

Please, read the enclosed safety instructions carefully and observe them!
These instruments should be safeguarded by individual or common fuses (breakers)!
For safety information the EN 61 010-1 + A2 standard must be observed.
This instrument is not explosion-safe!

TECHNICAL DATA

Instruments of OMC 8000 range conform to the government ordinance no. 17/2003 Coll. and no. 616/2006 Coll.

The instruments are up to the following European and Czech standards:
EN 61010-1, Electrical safety
EN 61326-1, Electrical measuring, control and laboratory equipment - EMC requirements „Industrial areas"
EN 61131-2: 2003, Programmable Logical Controllers - Equipment and tests requirements
IEC 980: 1993, article. 6, Seismic capacity

The instruments are applicable for unlimited use in agricultural and industrial areas.

CONNECTION

Power supply leads from the main line have to be physically separated from the measuring leads.

2. DESCRIPTION OF PLC

2.1 DESCRIPTION

For our PLC OMC 8000 range we selected module architecture. At the heart of the system there is the main module which can be accompanied by up to 31 expansion modules. These can be both nearby, or at a distance. The maximum distance is up to 40 m while the maximum data flow is still maintained. If this distance is not enough, or a greater computing/communication power is required, (splitting programs into more main modules), it is possible to connect main modules using UDP over Ethernet over almost any distance.

Communication is realised using the CAN interface. It needs to be remembered that the higher the number of expansion modules, the higher the demands on the communication line there will be. The main module can be powered by 230 V or 24V. It contains three digital inputs, which react to the power supply voltage. It also comes with six versatile inputs, all of which are electrically isolated (sharing a common ground terminal amongst them), from outputs and power supply.

These can process the following signals:

• pulse up to 30 V

• pulse - contact, NPN open collector

• analogue, voltage up to 30 V

• analogue, current up to 20 mA

• analogue, resistance up to 3900 Ω

• analogue, Pt 1000, Ni 1000, Pt 100 (only two inputs)

• analogue, T/C - B, E, J, K, L, N, R, S, T, XK

• analogue, KTY81-2xx

Versatile inputs can also be used as two full reversible inputs working in two modes:

1. for incremental encoders – where two input signals come with a 90° phase shift + zeroing pulse.

2. where one pulse input is registered and the other controls the direction of pulses (adding/subtracting) + zeroing pulse

One pair can be used as RS485 for communication with external devices such as numerical or text displays, operator panel etc.

ADVANTAGAES OF OMC 8000

• module architecture with the possibility of connection up to 31 modules

• colour TFT display which provides information about the state of the entire system

• ETHERNET 100Base

• data recording to a microSD card (content is defined by user)

• universality of inputs (digital, analogue, frequency, data)

• two inputs for IRC encoders (0,5 MHz) or six PNP/NPN/contact (0,5 kHz)

• five relay or open collector outputs

• slot for a micro SD k card allows to transfer of programs and data acquisition

• online editing which allows for program debugging

• programming is in a maximum extend compatible with standard EN 61131-3:2003

2.2 PROGRAMMING

MULTIPROG® 5.35

MODERN AND POWERFUL SYSTEM OF PROGRAMMING ACCORDING TO IEC 61131

MULTIPROG is a simple and easy to use IEC software used for PLC programming. It is used worldwide in various industries ranging from engineering through automotive industry to process automation. MULTIPROG supports distributed systems with multiple controls in one project.

MULTIPROG is also optimized to control ProConOS runtime system that is available for embedded solutions as well as for PC. It can be adapted to any already existing control runtime systems.

Programming and structure of the project are in line with the international standard IEC 61131-3. IL and ST are PLCopen certified. MULTIPROG runs on Microsoft Windows ® XP, Vista and Windows 7

MULTIPROG DEVELOPMENT

IEC 61131 programming system includes programming languages:

Instruction List (IL), Structured Text (ST), Ladder Diagram (LD), Function Block Diagram (FBD), sequential function chart (SFC)

as well as:

• project manager, including library management, editing and project wizard
• modern editor that facilitates the development of graphical data LD / FBD, text editor with syntax highlighting and IntelliSense
• table-oriented editor of variables to simplify and secure the declaration of variables and instances
• cross-references available in the editing window and in the debug mode
• compilation of code which is optimized only for the modified parts of a simulation project
• integrated PLC with advanced simulation mode, debugging and commissioning, logic analyzer, breakpoints, overwrite mode
  and forcing variables
• time window with continuous information about the status of the application; detailed help system
• user interface in English, German, French, Spanish, Italian, Chinese and Japanese

SYSTEM REQUIREMENTS

COMPUTER	
Processor	Min. Core Duo 1,6 GHz
RAM	Win XP: 500 MB Win 7/Win Vista: 500 MB
Hard disc	Min. 500 MB of free space
Interface	TCP/IP and/or RS 232
Operating system	Win XP SP 3, Win Vista SP2 a Win 7 (32 bit) Internet Explorer > 5.0, required
DATA TYPES	
Bit stream	BOOL (1/8), BYTE (8), WORD (16), DWORD (32)
Numeric	SINT(8), INT(16), DINT(32), USINT(8), UINT(16), UDINT(32), REAL(32), Time (TIME), arrays (ARRAY), structures (STRUCT) and strings (STRING)
SYSTEM LIMITS	
Nodes in the project tree	8000
Configurations / resources in the project tree	100/100
Program instances per resource	1000
Tasks per resource [1]	16
Program instances per task	500
Global variables / local variables per POU	15000/15000
Included libraries	32
POUs in one project (incl. POUs of libraries)	2000
Number of I/Os supported per project	64 Kb
I/O groups	200

[1] Only periodic and default tasks

3. CONNECTING THE PLC

Power supply leads of the PLC should not be in the proximity of low level input signals.

Contactors, motors with larger input power and other power devices should not located be near the unit.

Input signal leads (measured variable) should be at a sufficient distance from all power lines and devices. If this can not be guaranteed, it is necessary to use shielded cable connected to the cabinet frame.
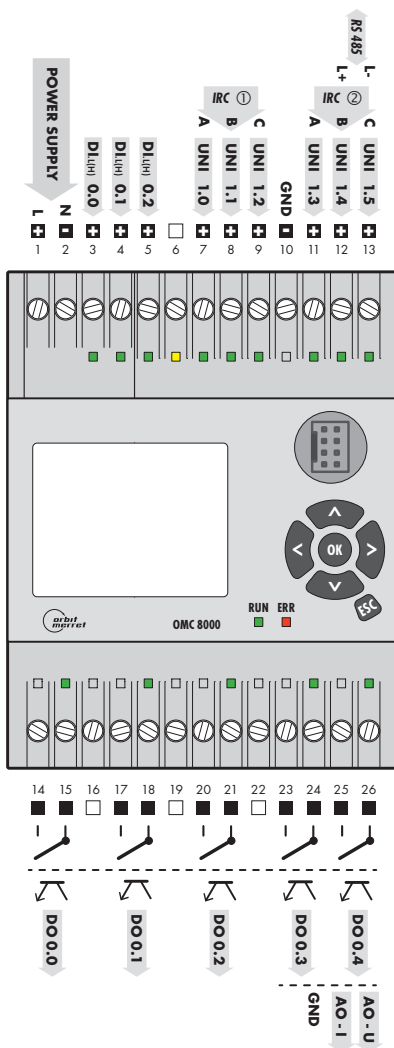
Our devices are tested according to interantional standards for use in industrial areas, however we still we recommend you to follow the above principles.

ANALOGUE INPUTS

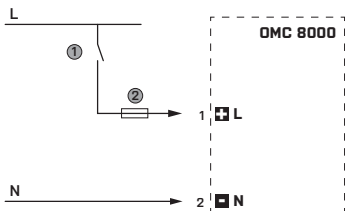|	UNI
RANGE	0...60/450 mV 0...2,8/10/20/30 V 0/4...20 mA 0...390/3900 Ω Pt 100/1 000/Ni 1 000 T/C - J/K/T/E/B/S/R/N/L PNP/NPN/contact (0,5/500 kHz) IRC (500 kHz), (2x) KTY 81 - 2xx
CONNECTION	terminals (GND + no. 7/8/9/11/12/13)

DIGITAL INPUTS

	RANGE	CONNECTION
DI.L(H)	12...30 V AC/DC or 80...250 V AC	contact, terminals (N + no. 3/4/5)

POWER SUPPLY

RS 485

L-
L+

IRC ①   IRC ②

L	N	DI L(H) 0.0	DI L(H) 0.1	DI L(H) 0.2		UNI 1.0 A	UNI 1.1 B	UNI 1.2 C	GND	UNI 1.3 A	UNI 1.4 B	UNI 1.5 C
1	2	3	4	5	6	7	8	9	10	11	12	13

OMC 8000

RUN ERR

14 15 16 17 18 19 20 21 22 23 24 25 26

DO 0.0   DO 0.1   DO 0.2   DO 0.3   DO 0.4

GND   AO - I   AO - U

3. CONNECTING THE **PLC**

Power supply connection

① Switch
② Fuse
   T630mA   for supply 80…250 V AC/DC
   T2A   for supply 12…30 VDC, 24 VAC

Connection of I/Os
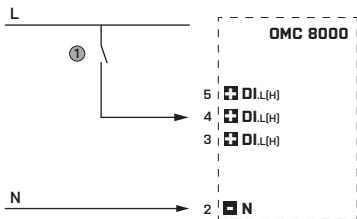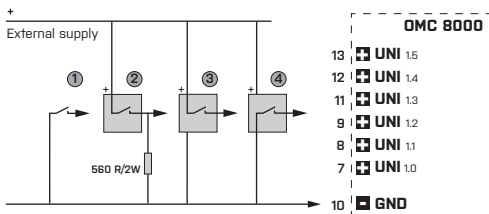

① Contact

ATTENTION!
The voltage range of the I/O inputs are always identical with the voltage level of OMC 8000 power supply. This means there may be high voltage!
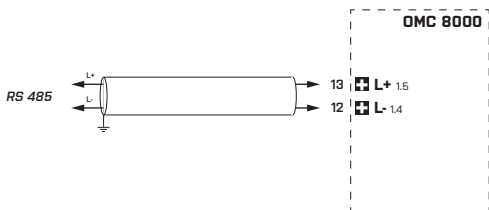
Connection of analogue inputs
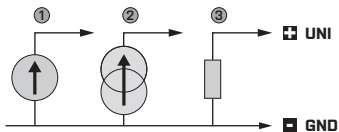
① 0…60/450 mV, 0…2,8/10/30 V
   Thermocouple - J/K/T/E/B/S/R/N/L
② 0/4…20 mA
③ 0…390/3900 Ω
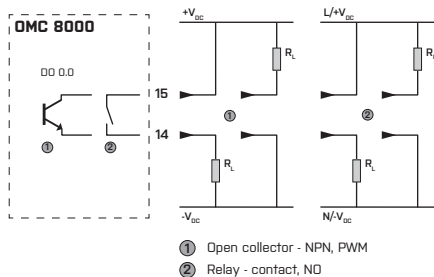   Pt 100/1 000/Ni 1 000
   KTY 81-2xx

Connection of digital inputs

+
External supply

OMC 8000

13	➕ **UNI** 1.5	
12	➕ **UNI** 1.4	
11	➕ **UNI** 1.3	
9	➕ **UNI** 1.2	
8	➕ **UNI** 1.1	
7	➕ **UNI** 1.0	
10	➖ **GND**	

① ② ③ ④

560 R/2W

① contact
② 2-wire sensors, **PNP** NO
③ 3-wire sensors, **PNP** NO
④ 3-wire sensors, **NPN** NO

+
External supply

OMC 8000

9	➕ **UNI** 1.2	*IRC-1*
8	➕ **UNI** 1.1	
7	➕ **UNI** 1.0	
10	➖ **GND**	

OMC 8000

13	➕ **UNI** 1.5	*IRC-2*
12	➕ **UNI** 1.4	
11	➕ **UNI** 1.3	
10	➖ **GND**	

+
A
B
C
GND

Connection of data bus

RS 485

L+
L-

OMC 8000

13	➕ **L+** 1.5	
12	➕ **L-** 1.4	
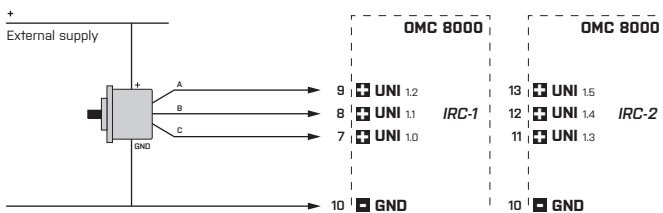
3. CONNECTING THE **PLC**

Outputs

OMC 8000

DO 0.0

① Open collector - NPN, PWM
② Relay - contact, NO

Wiring diagram is applicable even for other outputs

DO 0.1   terminals: 17/18
DO 0.2   terminals: 20/21
DO 0.3   terminals: 23/24   *N/A when AO is fitted*
DO 0.4   terminals: 25/26   *N/A when AO is fitted*

Connection of Analogue Ouptut (AO)

OMC 8000

DO 0.4

AO - U
AO - I
GND

① Voltage analogue output
② Current analogue output
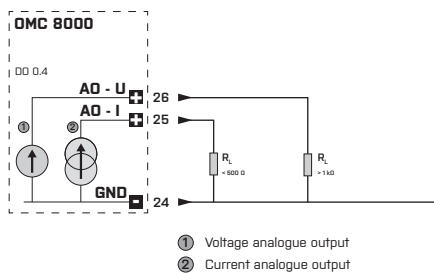
4. PLC SETTINGS

ENTERING THE MENU OF OMC8000

Instrument's menu can be entered in two different ways:

1. By pressing the **OK** key while the screen which lists the connected modules is displayed and hold it for the entire duration of its projection. Alternatively while the **OK** key can be kept pressed already from the moment of Power-on.
2. By pressing the **UP** and **DOWN** keys simultaneously for 3 seconds (Arrow Up and Arrow Down) provided the PLC program is not running (LED **RUN** is not on). Only in this way the menu item Start can be accessed.

The menu can be protected by a numerical password. If the device is password protected opening screen is displayed first and there you can select the language and enter the password. After the correct password is accepted or if your device is not password protected the main menu is displayed.

LANGUAGE OF THE MENU

The device menu is available in four languages: English, Czech, German and French.

NAVIGATING THE MENU

Use **UP/DOWN** to scroll through the current level of menu items. Use **LEFT** button to go up one level or if the current level is the highest (Main) the menu will be closed. You can exit the menu by pressing the ESC button at any level. Press **OK** to switch to a lower level menu (into submenu), or enter into a menu item which is to be edited.

Beginning and end of the menu are marked by a thick horizontal line. If either of these two lines is missing, then the page is longer than what can be displayed at once on the screen. Use **UP/DOWN** buttons to scroll through the menu items to get to those which are not currently shown.

If there is no activity for longer than one minute, the menu will be automatically terminated. If editing is open, then after one minute it will be closed without changes saved, and after another minute the menu will close.

OPENING PAGE TO ENTER A PASSWORD
Setting LANGUAGE

Use **UP** and **DOWN** to change the language. Press **ESC** to stop editing and return to the original setting. **OK** confirms the selected value.

Setting PASSWORD

LEFT and **RIGHT** buttons select the position to be edited. **UP** and **DOWN** buttons change the value. Press **ESC** to stop editing and return to the original setting. **OK** confirms the selected value. After confirming the entered password is compared with the password that is set in the main menu. If it is correct, the main menu is displayed.

```
                              OMC 8000
  orbit                    192.168.1.48
  merret               12.06.15  14:22:45
─────────────────────────────────────────
 Language                        English
 Password                            ****
```

MAIN MENU OF PLC OMC 8000
Setting LANGUAGE

Use **UP** and **DOWN** to change the language. Press **ESC** to stop editing and return to the original setting. **OK** confirms the selected value.

```
                              OMC 8000
  orbit                    192.168.1.48
  merret               12.06.15  14:22:45
─────────────────────────────────────────
 Language                        English
 Password                            ****
 Quick start                          No
 Block debug                          No
 Autorecovery                        Yes
 RTC
 Display
 Edit modules
 Reread modules
 Ethernet
─────────────────────────────────────────
```

Setting PASSWORD

LEFT and **RIGHT** buttons select the position to be edited. UP and DOWN buttons change the value. Press **ESC** to stop editing and return to the original setting. **OK** confirms the selected value. If the PLC is already password protected, then „****" is displayed.

Setting QUICK START

Use **UP** and **DOWN** buttons to set the behaviour of the device after power-up. If the value is **NO**, then a list of connected modules will be displayed for the duration of 3 second. Press **ESC** to stop editing and returns to the original setting. **OK** confirms the selected value.

Setting BLOCK DEBUGGING

The setting is the same as „Fast start". If the setting is **YES**, then you can not commu-nicate with the PLC via TCP / IP - MULTIPROG and OPC server, but UDP communication remains functional. A yellow confirmation window appears with the following text: A restart is required to make changes active. Restart now?

Setting of AUTORECOVERY

In case communication with the module is lost, **UP** and **Down** keys can be used to set the instrument's behaviour. If **YES** is selected, communication is established with modules which were switched on later or with which communication was lost temporarily. The state of connected modules can be determined using function ReadSysteInfo with parameter 4.

Individual output bits signal communication error:
0x00000002 … adresa 1
0x00000004 … adresa 2
0x00000008 … adresa 3
0x00000010 … adresa 4
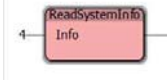
Submenu CLOCK

Setting TIME

Time is to be set in parts and each part is to be set as **PASSWORD**. Moving among the parts: For moving to the left hold **LEFT** and press **RIGHT**. In the opposite direction hold **RIGHT** and press **LEFT**. The time is in 24 hour format.

Setting DAY

Same setting procedure as **LANGUAGE**. Selects the day of the week.

In the program day of the week can be accessed as an INT type of number, where **0** is Monday, **1** is Tuesday, **2** is Wednesday, …, **6** is Sunday..

Setting DATE

This item is set in the same way as **TIME**.

Setting DAYLIGHT SAVING TIME (DST)

Same setting procedure as **LANGUAGE**. This item can be changed automatically according to the rules applicable within the European Union, ie the transition to summer time on the last Sunday in March at 2:00 -> 3:00 and return back to standard time on the last Sunday in October at 3:00 -> 2:00. Automatic change takes effect after a power-up in case the PLC was off at the moment of time of transition. Transition to DST may be postponed if the PLC is switched on after 23:00. Change will be made at the beginning of the following day. Transition to standard time may be postponed if the PLC is switched on between midnight and 1:00. Change will take effect after 1:00 am.

Setting DST AUTOMATICALLY

Same setting procedure as **LANGUAGE**. Enables automatic changes in item **DAYLIGHT SAVING TIME**.

Setting CORRECTION OF TIME

This item is set in the same way as **PASSWORD**. Correction is entered in incremental steps. Input range is **-64** to **+63** steps. Correction by one increment equals to 0.187 s/day.

Information: **1 increment = 0.187**. This is a factual information. This value cannot be adjusted

Submenu DISPLAY

Setting of BLANKING

It is set in the same way as **LANGUAGE**. Option **AUTOMATIC** disables the display after a preset timeout after the last keystroke. The display goes into a power-saving mode by switching itself off. Option **PROGRAM** hands over the control of display to a user application. If power saving mode for the display is not defined in the user application, the display stays on continuously.

An automatic switch-off of the display 15s after the last keystroke can be programmed this way:
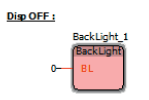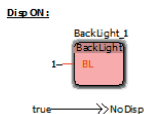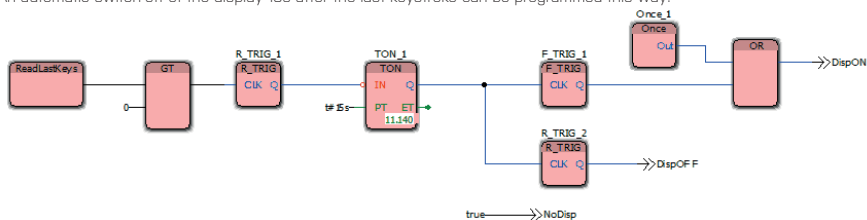
Function block Backlight newly not only turns off the backlight, but also switches the display into the **SLEEP** mode, as if the display was switched off completely.

Function block Backlight can be used even when automatic switch-off is enabled. The behaviour of the display is then controlled by both functions.

When the display is off, the **LED RUN** flashes this way:
- when a user program with duty cycle 1:7 is running (flashes shortly)
- when a user program with duty cycle 7:1 is running (switches off shortly)

Setting TIME

It is set in the same way as **PASSWORD**. It defines time in minutes from the last keystroke to the display's switch-off.

Action TEST LED

It is a test of signalling LEDs, which light up one by one and then all at once. This est can be terminated/exited by pressing the **ESC** key.

EDIT MODULES

This menu item allows you to assign addresses the connected modules. If no module is connected, the inscription „**Without expansion modules**" appears.

Changes made in this menu are irreversible.

Use **UP/DOWN** buttons to select the module to be included. LED **RUN** flashes on the selected module. Press **OK** to activate the module chosen for inclusion - it is displayed inversely.
By using the **UP / DOWN** buttons the module is placed on the desired position in the list. **OK** deactivates the module. **ESC** ends the process.

Setting RE-READ MODULES

Resets the table of modules and re-loads it again. The rest is identical as described above.

ETHERNET submenu

Options for network communication.

Setting of USE DHCP

Enables the use of DHCP server. When changing settings from NO > YES a device restart is required. A yellow window with text appears.

```
              OMC 8000
           192.168.1.45
        12.06.15 14:23:56


      A restart is necessary
         to activate DHCP

         ┌─────────────────┐
         │   Restart now?  │
         └─────────────────┘
```

Setting of IP ADDRESS

It is set in the same way as **TIME**. Current IP address is shown. After entering the editing process IP address which is to be used is shown, provided DHCP server is not allowed.

NET MASK

It is set in the same way as **IP ADDRESS**. Current subnet mask is shown. After entering the editing process NET MASK which is to be used is shown, provided DHCP server is not allowed.

```
              OMC 8000
           192.168.1.48
        12.06.15 14:23:32

Use DHCP                   Yes
IP address        192.168.1.48
Subn. mask     255.255.255.0
D. gateway         192.168.1.1
MAC add.    B4.2A.39.00.00.03
```

Setting D. GATEWAY

It is set in the same way as **IP ADDRESS**. Current default gateway is shown. After entering the editing process the default gateway which is to be used is shown, provided DHCP server is not allowed.

Display the MAC ADR.

Current MAC address. Can not be changed

Action FW UPDATE

```
              OMC 8000
           192.168.1.48
        12.06.15 14:22:45

Autorecovery              Yes
RTC
Display
Edit modules
Reread modules
Ethernet
FW update
SW backup
Start                     Off
About PLC
```

Program OM finder is used for FW updates.

The actual update is realised by a bootloader, which is a separate part of the firmware. Switching over to the bootloader is possible either remotely, or in this menu item (FW UPDATE)

Before update this yellow confirmation window appears.

Bootloader will be launched automatically every time when damage to firmware is detected.

```
              OMC 8000
           192.168.1.45
        12.06.15 14:24:12

       To update FW use
      program OM Finder

      ┌──────────────────┐
      │   Update now?    │
      └──────────────────┘
```

Submenu SW BACKUP

Options for the backup of user program to SD card.

Action BACKUP

Creates a file backup.plc on the card in the root directory. It is a binary image of the user application. The file content is identical to the contents of the file, which can be found in the folder at the path:

[project folder] \ [project name] \ C \ [Configuration] \ R \ [source] \ image.bin
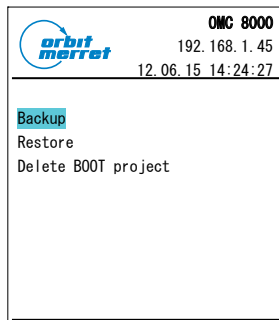
```
                        OMC 8000
  orbit                192.168.1.45
  merret         12.06.15 14:24:27

Backup
Restore
Delete BOOT project
```

Action BACKUP

Restores stored image.

Action Delete BOOT project

A yellow confirmation window with text appears.

If this window is confirmed by pressing OK, the BOOT project will be irreversibly removed from the internal NAND FLASH.

```
                        OMC 8000
  orbit                192.168.1.45
  merret         12.06.15 14:24:42

      Do you really want to
       remove BOOTPROJEKT
      It cannot be recovered

         Remove now?
```

Submenu START

Allows to run the user program after an error or after recovery. Before performing this action, we recommend checking on the communication with modules by running the settings EDIT MODULES.

Action COLD

Consistent with controls in MULTIPROG it executes the start of the program including setings of all variables.

Action WARM

Consistent with controls in MULTIPROG it executes the start of the program while it sets only non-retain variables.

```
                        OMC 8000
  orbit                192.168.1.45
  merret         12.06.15 14:25:17

Cold
Warm
```
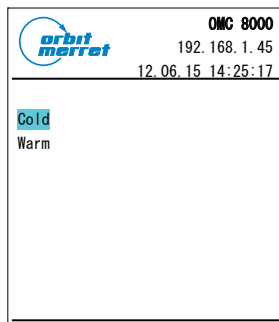
Submenu ABOUT PLC

This submenu contains no adjustable item and only provides information about the device:

Identification of HW
Description of core ProConOS
Kernel version of ProConOS
FW version
Serial number
MAC address
Contact Information

```
                        OMC 8000
  orbit                192.168.1.45
  merret         12.06.15 14:26:10

OMC 8000                      06-15
          ProConOS eCLR@Cortex-M4
                        2.2.0.20213
          8.01 Jun 10 2015 10:12:54
Ser. number        120150610789
MAC adr.       B4.2A.39.00.00.03
ORBIT MERRET, spol s r. o.
Vodnanska 675/30
198 00 Praha 9, Czech Republic
www.orbit.merret.cz
```
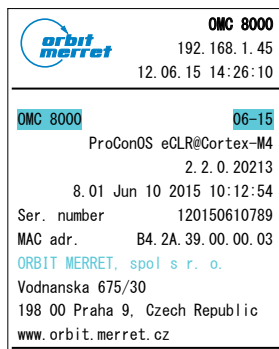
Support programs for OMC 8000

They are located in the installation folder of MULTIPROG in a subfolder Orbit_Merret

OM Finder

Program OM finder has been created for an easier configuration of sources in MULTIPROG. This program can scan and search for all OMC 8000 units available in the network and display basic information. After clicking on the selected PLC using the drag and drop method (CTRL + C and CTRL + V) IP address can be transferred into the setting of the source.
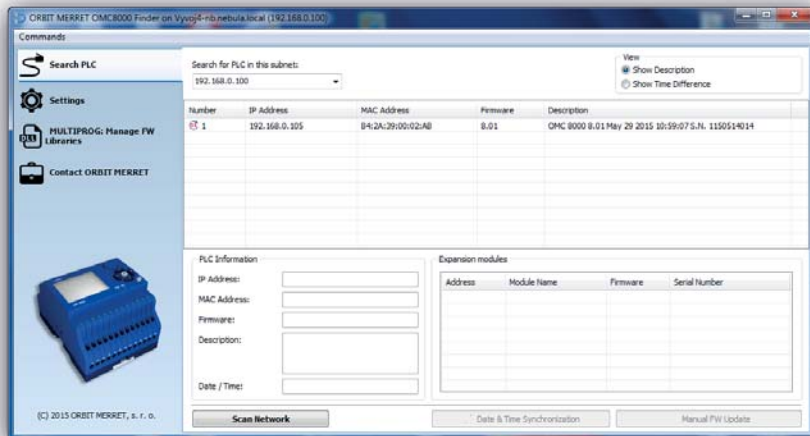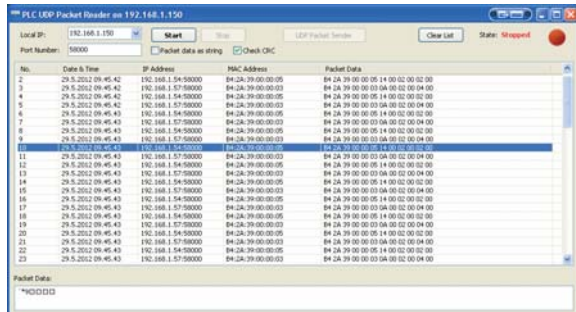
Program offers:

- updates of FW and PLC
- FW update
- languages: CZ, EN, DE, FR, RU
- searches for and identifies expansion modules
- synchronisation of date and time, checking of the oscillator
- updates of MULTIPROG libraries
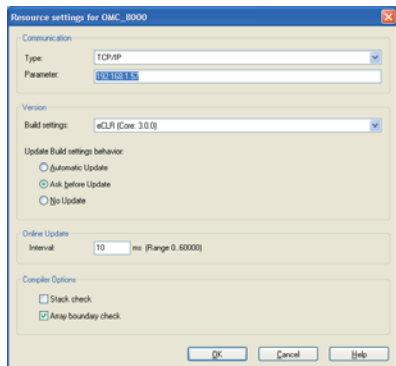
PLCReadPacket

The program is designed to monitor UDP communication between PLCs, as a diagnostic tool.

OM_IO_Driver

IO driver to work with logical inputs and outputs. The values of counters, analog inputs and other data obtained by PLC is read using functions and function blocks.

Input ports form one continuous line, automatically generated based on the address assigned and properties of modules.

The main module OMC 8000 has two Bytes of logic inputs and one Byte of outputs:
Address %IX1.0 to %IX1.5   universal inputs
Address %IX0.0 to %IX0.2   inputs responsive to the unit's power supply voltage
Address %QX0.0 to %QX0.4   outputs

The other Bytes are not used. Other addresses in the system according to the configuration on the right would be:
Address %IX2.0 to %IX2.7   inputs OMC 8000.10DO
Address %IX3.0 to %IX3.2   inputs A, B, C of module OMC 8100.SM
Address %IX4.0 to %IX4.2   inputs A, B, C of module OMC 8000.SM
Address %IX5.0 to %IX5.2   inputs A, B, C of module OMC 8000.SM
Address %QX1.0 to %QX1.7   first 8 outputs OMC 8100.10DOx
Address %QX2.0 to %QX2.1   remaining outputs OMC 8100.10DOx

Other addresses are not assigned. Distribution of inputs and outputs is described in the user manual, data sheet and a module's product label. If some BOOL outputs are not used in the program, they can be set according to the status of inputs, such as %QX0.2 = %IX0.2

Initialization of HW
The main module OMC 8000 and expansion modules need to be initially configured - desired modes of inputs and outputs need to be selected. For this purpose Company firmware libraries contain several function blocks created for this purpose. They are described in Help libraries.
This configuration block is executed only once at start-up. It is therefore not possible to dynamically change the configuration of hardware during runtime. In order not to have the execution of the main program delayed by the execution of these blocks a special system configuration task - StartTask has been created.
This task is run once at the start of any application - cold, warm or hot.

Status word
The main module uses only the lowest bit of the status word.
This bit is set if there is a loss of function in real-time clock. The user application can then be completed in the following way.

orbit merret	OMC 8000
	192. 168. 1. 48
	12. 06. 15 14:23:14

| 1 | 8000. 10DO | 120120313012 |
2	8100. SM	120120409024
3	8100. SM	120120409025
4	8100. SM	120120409026
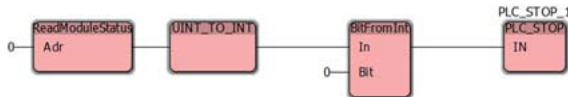
4. PLC SETTINGS

SHARED MEMORY %M3

Shared memory M3.0% -% M3.8191, a total of 3 kB, is allocated to communication between PLC, HMI and other devices. MULTIPROG can not automatically place the variables in the memory and does not check for overlapping variables. This feature can be useful if you need to change only a part of the data in the memory. Data in this section of memory can be saved as retain (backup data).

RETAIN MEMORY

The data that must not be lost when the PLC is switched off is stored in section of memory called retain (preserve, store). MULTIPROG automatically places all data marked with a retain sign into this section. The size of the buffer is 1 kB, of which 8 bytes is used by the system..

OM_RS_Driver
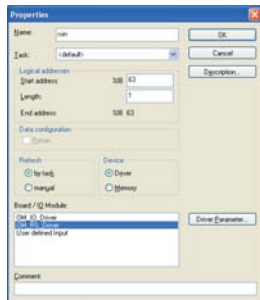
OM_RS_Driver has been designed to operate the RS485, which is located at input UNI1.4 (L-terminal 12) and UNI1.5 (L +, terminal 13). To set parameters for this driver it is needed to create a group of inputs or outputs 1 Byte long. The address of this Byte is not important, because OM_RS_Driver accesses the shared memory directly. The setting may look like this:

OM_RS_Driver lets you use 6 different communication protocols. All share the setting of communication speed in the range of 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 Baud. Apart from the universal ASCII protocol the communication has the following parameters: 8 data bits, 1 stop, no parity.

For ASCII master and ASCII slave protocols it is necessary to define the data type String8, which is used for storing and retrieving data.

This is done in the section DataTypes using the following definition:

```
TYPE
 String8:STRING(8);
END_TYPE
```

MULTIPROG stores strings with other information, so in the memory there is stored 5 + length Bytes, according to the following schedule:

MLL MLH LL LH	Ð Ð … Ð Ð … Ð
MLL / MLH	maximum length of lower / higher Byte (maximum of 32,762 Bytes)
LL / LH	current length lower / higher Byte
D	data
Ø	Byte code ØxØØ

1. ASCII SLAVE

- OMC 8000 communicates as a common ORBIT MERRET device and has three parameters:

• number of data for output, data is stored from the beginning of the shared memory

• the number of data for input, data follow output data

• address on bus 0 … 31

- There can be a maximum of 232 data

- Output data can be read by commands 1A .. 1 NO, 1 .. 1z, ... 4A .. 4Z, 4a .. 4z
- Output data can be read also by command 7W. Data are transmitted separated by semicolons and have a variable length of 0-8 bytes
- Output data can not be changed via RS
- Input data are entered with a flag 5A .. 5Z, 5 .. 5Z, ... 8A, 8Z .., 8 .. 8z, each parameter has a maximum of 8 characters
- Data in the shared memory are stored according to the following table:

Write/Read	Address	Write/Read	Address	Write/Read	Address	Write/Read	Address
1A/5A	0	2A/6A	676	3A/8A	1352	4A/9A	2028
1B/5B	13	2B/6B	689	3B/8B	1365	4B/9B	2041
1C/5C	26	2C/6C	702	3C/8C	1378	4C/9C	2054
1D/5D	39	2D/6D	715	3D/8D	1391	4D/9D	2067
1E/5E	52	2E/6E	728	3E/8E	1404	4E/9E	2080
1F/5F	65	2F/6F	741	3F/8F	1417	4F/9F	2093
1G/5G	78	2G/6G	754	3G/8G	1430	4G/9G	2106
1H/5H	91	2H/6H	767	3H/8H	1443	4H/9H	2119
1I/5I	104	2I/6I	780	3I/8I	1456	4I/9I	2132
1J/5J	117	2J/6J	793	3J/8J	1469	4J/9J	2145
1K/5K	130	2K/6K	806	3K/8K	1482	4K/9K	2158
1L/5L	143	2L/6L	819	3L/8L	1495	4L/9L	2171
1M/5M	156	2M/6M	832	3M/8M	1508	4M/9M	2184
1N/5N	169	2N/6N	845	3N/8N	1521	4N/9N	2197
1O/5O	182	2O/6O	858	3O/8O	1534	4O/9O	2210
1P/5P	195	2P/6P	871	3P/8P	1547	4P/9P	2223
1Q/5Q	208	2Q/6Q	884	3Q/8Q	1560	4Q/9Q	2236
1R/5R	221	2R/6R	897	3R/8R	1573	4R/9R	2249
1S/5S	234	2S/6S	910	3S/8S	1586	4S/9S	2262
1T/5T	247	2T/6T	923	3T/8T	1599	4T/9T	2275
1U/5U	260	2U/6U	936	3U/8U	1612	4U/9U	2288
1V/5V	273	2V/6V	949	3V/8V	1625	4V/9V	2301
1W/5W	286	2W/6W	962	3W/8W	1638	4W/9W	2314
1X/5X	299	2X/6X	975	3X/8X	1651	4X/9X	2327
1Y/5Y	312	2Y/6Y	988	3Y/8Y	1664	4Y/9Y	2340
1Z/5Z	325	2Z/6Z	1001	3Z/8Z	1677	4Z/9Z	2353
1a/5a	338	2a/6a	1014	3a/8a	1690	4a/9a	2366
1b/5b	351	2b/6b	1027	3b/8b	1703	4b/9b	2379
1c/5c	364	2c/6c	1040	3c/8c	1716	4c/9c	2392
1d/5d	377	2d/6d	1053	3d/8d	1729	4d/9d	2405
1e/5e	390	2e/6e	1066	3e/8e	1742	4e/9e	2418
1f/5f	403	2f/6f	1079	3f/8f	1755	4f/9f	2431
1g/5g	416	2g/6g	1092	3g/8g	1768	4g/9g	2444
1h/5h	429	2h/6h	1105	3h/8h	1781	4h/9h	2457
1i/5i	442	2i/6i	1118	3i/8i	1794	4i/9i	2470

Write/Read	Address	Write/Read	Address	Write/Read	Address	Write/Read	Address
1j/5j	455	2j/6j	1131	3j/8j	1807	4j/9j	2483
1k/5k	468	2k/6k	1144	3k/8k	1820	4k/9k	2496
1l/5l	481	2l/6l	1157	3l/8l	1833	4l/9l	2509
1m/5m	494	2m/6m	1170	3m/8m	1846	4m/9m	2522
1n/5n	507	2n/6n	1183	3n/8n	1859	4n/9n	2535
1o/5o	520	2o/6o	1196	3o/8o	1872	4o/9o	2548
1p/5p	533	2p/6p	1209	3p/8p	1885	4p/9p	2561
1q/5q	546	2q/6q	1222	3q/8q	1898	4q/9q	2574
1r/5r	559	2r/6r	1235	3r/8r	1911	4r/9r	2587
1s/5s	572	2s/6s	1248	3s/8s	1924	4s/9s	2600
1t/5t	585	2t/6t	1261	3t/8t	1937	4t/9t	2613
1u/5u	598	2u/6u	1274	3u/8u	1950	4u/9u	2626
1v/5v	611	2v/6v	1287	3v/8v	1963	4v/9v	2639
1w/5w	624	2w/6w	1300	3w/8w	1976	4w/9w	2652
1x/5x	637	2x/6x	1313	3x/8x	1989	4x/9x	2665
1y/5y	650	2y/6y	1326	3y/8y	2002	4y/9y	2678
1z/5z	663	2z/6z	1339	3z/8z	2015	4z/9z	2691

2. ASCII MASTER
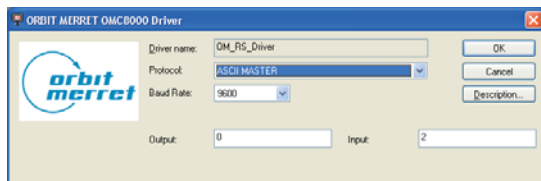
- OMC 8000 can display data on Orbit Merret's OM xxxRS series displays and reads data from Orbit Merret devices and has two parameters:
  • number of data for output, data is stored from the beginning of the shared memory
  • number of data for input, data follow output data
- output data are transmitted through command 9, each parameter is 0-8 characters (eg, # 009888,888 <CR>)
- input data are obtained through command 7W and stored in memory sequentially. Where there is no data, NoData is stored. Eg. for OM 402UNI two strings are stored - the value of channel A and MF, for OMU 408UNI it will be 9 strings
- addresses of individual strings correspond to those of the previous table

3. MODBUS RTU SLAVE
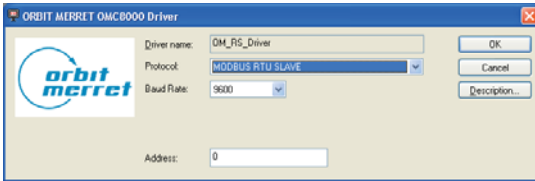
- OMC 8000 acts as a standard slave with a memory accessible as HOLDING registers (address 40001)
  Register 40001 =% MW3.0, 40002 =% MW3.2, 40003 =% MW3.4 and has a single parameter:
  • an address on the MODBUS line. It can be set in the range of 1-247
- Up to 64 registers can be sent or received at one given moment
- **ATTENTION**: System PLC uses reverse placement of bytes in the memory, so in multi-word items words will be in reverse
  order. Eg.: In PLC long at address 100 in a value of 0x87654321 command AA 03 00 32 00 02 CR CR
  returns AA 03 04 43 21 87 65 CR CR (CR CR ... 16 bit CRC)
- Implemented commands:
  - 3 for reading
  - 6 and 16 for writing

4. MODBUS RTU MASTER
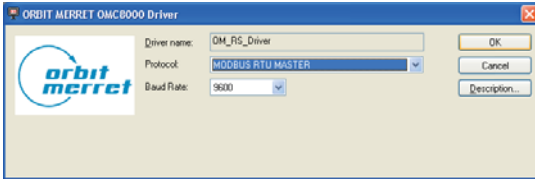
- uses universal send function block RsSend
- CRC is added behind the Count of sent Bytes
- parameters AsString, EndChar, EC_Count are in this case irrelevant
- the answer is received in full, INCLUDING CRC
- FB outputs are controlled like so:
- Done is set for the duration of sending a command, one program cycle is minimum
- Received is sets if the answer comes
- if data do not fit into the shared memory, they are not saved at all and Error is set
- Error is also set in the event of time out or at CRC error or if there is too much of data sent

5. PLC BUS

- special binary protocol for the fastest sharing of data between devices, where it is not desirable to use UDP communication over ETHERNET. It has four parameters:
  - start of data in the shared memory, which is shared with others
  - number of these data
  - address on the bus from 0 to 31. Addresses must start from 0, be ranked in order and be unique
  - maximum address on the bus. This parameter is identical for all PLCs
- PLCs take turns in regular cycles in broadcast cycles
- if the loop is interrupted, PLC with address 0 repeats its broadcast after 5 seconds

6. UNI MASTER

- it has 3 parameters to enter count of bits, stop bits and parity
- for sending / receiving function an RSSend function block is used including all parameters
- the length of the buffer is up to 136 characters. What does not fit in discarded. Overflow of the buffer is not reported
- if storing AsString is selected, then only as many characters are stored, as many the string permits. If the number of characters received greater, Error is announced
- if data do not fit the shared memory, they are not saved at all and Error is announced

OMC 8000 and MODBUS TCP

Slave

PLC OMC 8000 offers TCP port 502 for communication as a SLAVE with protocol MODBUS TCP.

The whole of shared memory is divided to HOLDING REGISTERs 4xxxx. Register 40001 answers to address 0000 in command as well as in shared memory. Register 40002 answers to address 0001 in command and to address %MW3.2 in shared memory. Register 40003 answers to address 0002 in command and to address %MW3.4 in shared memory. Commands 3, 6 and 16 are supported.

Master

In PLC OMC 8000 there are 6 ports MODBUS TCP communication as MASTER. A table for communication has been created. It is served by function ReadCounter and SetCounter in the following way:

Channel	Defaul IP	Nastavení IP SetCounter - Channel	Čtení IP ReadCounter - Channel	Default Port	Nastavení Port SetCounter - Channel	Čtení Port ReadCounter - Channel
1	192.168.1.53	101	101	502	111	111
2	192.168.1.77	102	102	502	112	112
3	192.168.1.60	103	103	502	113	113
4	192.168.1.65	104	104	502	114	114
5	192.168.1.70	105	105	502	115	115
6	192.168.1.75	106	106	502	116	116

Communication is processed in the same way as in case of MASTER MODBUS RTU on RS485 as described earlier in this user manual.

A frame of a message is compiled into the shared memory. Function block SendRs rends it is out and receives a reply.

Because the command is compiled by the user, all available commands are supported.

Getting started with OMC 8000

1. Create a new project using a template. Click on an icon depicting an empty sheet of paper ("New project").

2. The we can select a template for OMC - main module, with expansion modules or with modules with RS communication. The templates differ only in the number of libraries linked to them.
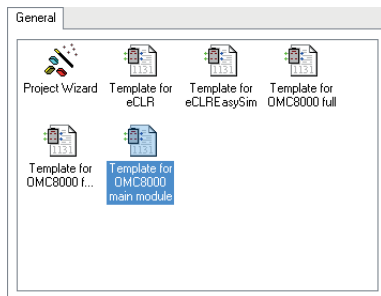
3. Set the PLC's IP address. Address can either be found on the PLC's LCD or it can be determined using a program called OM Finder.
IP address is entered manually as follows: right-click on > **Resource: OMC_8000*** / Settings / Parameter.
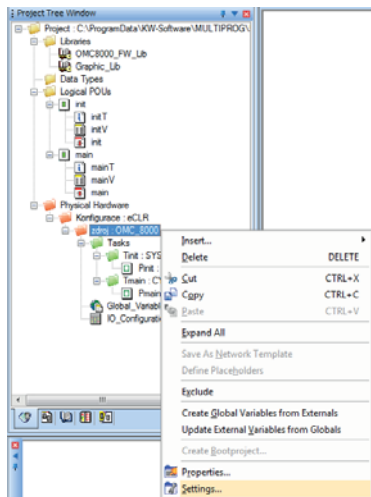
To help you familiarise yourself with the OMC 8000, here is an example of how to create a simple program. It is a basic counter, which will be increased by "1" every 100ms (time is pre-set in the project template). As the next step you will see how to project the counter on the PLC's LCD.

4. Save the new project under a distinctive name.

The project is stored by menu item Save Project As / Zip Project As... in menu File.
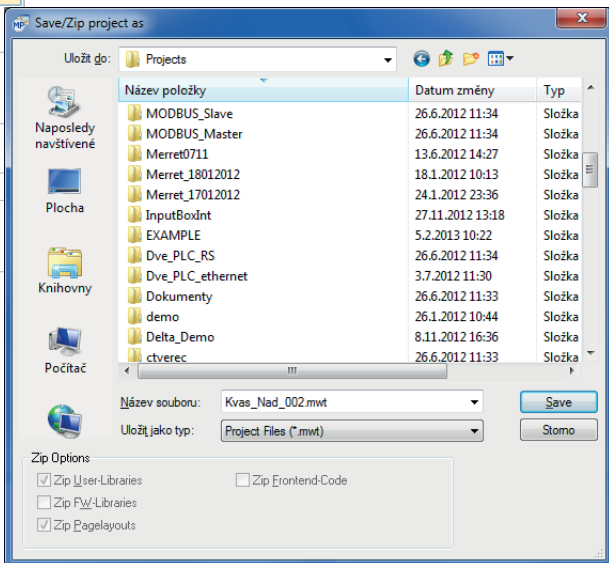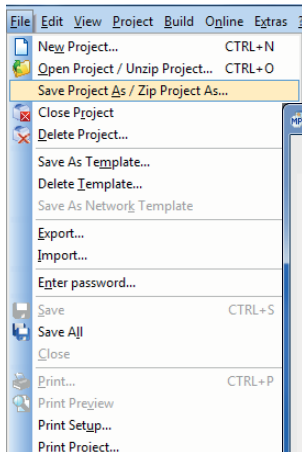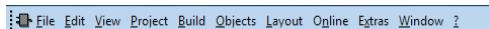
5. Open a worksheet of program "**main***", by clicking on a red icon POU main*..

6. Place function **ADD** into the worksheet.

This can be done in three ways:
- left mouse click into open white space and type **ADD** and then press ENTER
- drag and drop function **ADD** from the Edit Wizard on the right side of the screen. You will need to select Favorites Functions in the drop down menu of the Group
- left mouse click into open white space followed by left mouse double click onto **ADD** on the right hand side of the screen
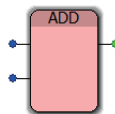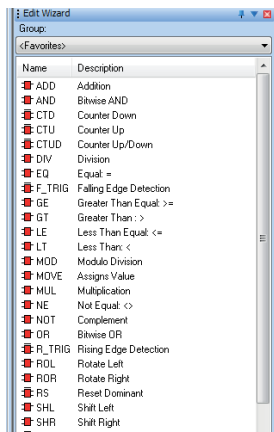
7. By clicking the lower blue circle open Properties of variable and enter the constant 1
Close the window by clicking OK.
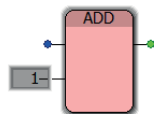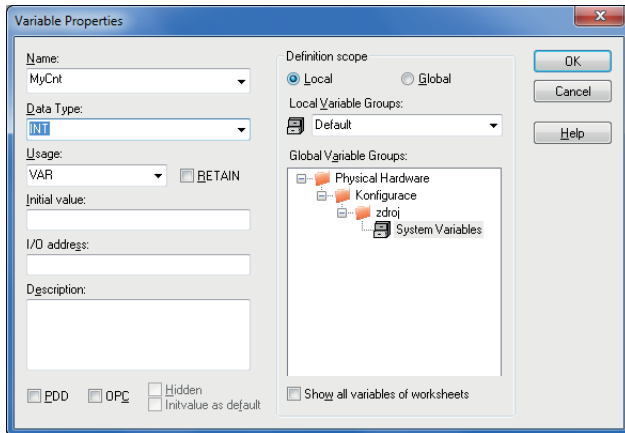
8. By clicking upper blue circle open **Properties of variable** and enter the Variable's name **Counter**. Set the data type to **INT** and usage to **VAR** - Scope local (Checkbox Show all variables in the worksheet must be deactivated). Close the window by clicking OK.
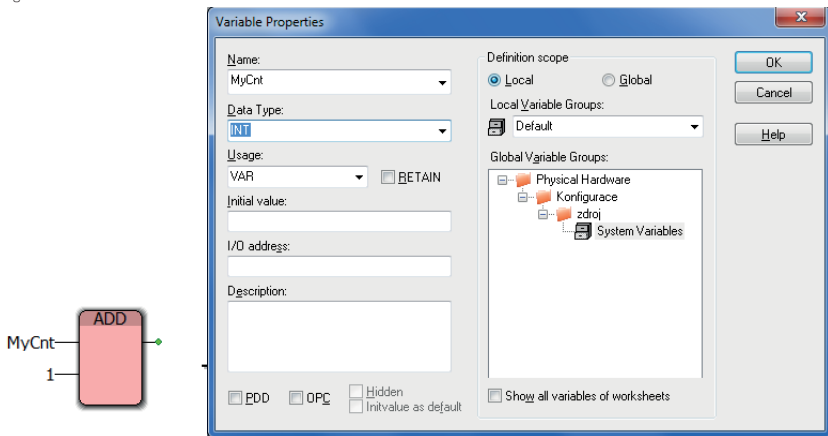
9. When you click the green circle and press P, the system allows you to connect Counter also to the output of the function. Confirm selection by pressing **ENTER**.
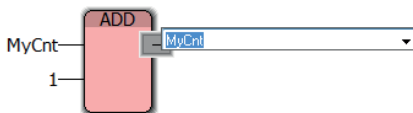
10. Program is finished now and it is ready to be compiled by pressing either F9 or by clicking the Compile icon (marked with image of two arrows going up-down).
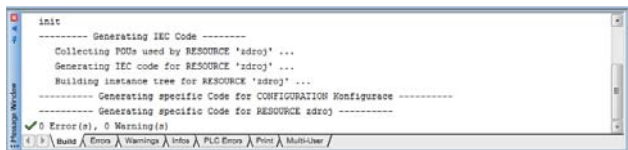
11. Open the Project Control dialog - marked with the image of green switch on dark background. Under the button **More...** kindly check the item **Permanent as Boot Project**, otherwise the program will not stay in the PLC after its restart.
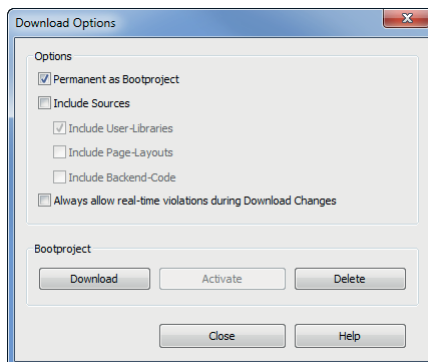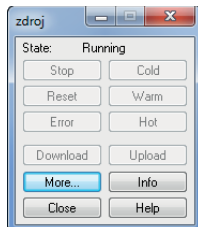
12. In the Project Control dialog: line State indicates the current state of the PLC. Button Stop stops the program. Buttons Cold, Warm and Hot are different ways of starting the program in the PLC. Button DOWNLOAD downloads a compiled program code into the OMC 8000.

```
Required memory for Retain Data: 0 bytes
Required memory for the Application Image: 28360 bytes
Predicted memory usage for Data: 1468 bytes
Proces pro Nahrát IEC projekt byl dokončen pro zdroj 'Konfigurace.zdroj' na 2.11.2012 12:27:07
```
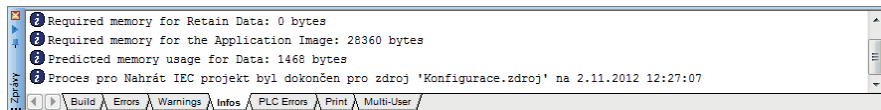
Ways of launching the program:

COLD   start, setting of initial values of all variables
WARM   start, does not change the state of RETAIN (storage of variables)
HOT   start does not change the state of any variables

13. Press COLD button to start the program. Activate the Debug mode in MULTIPROG to see what the program is actually doing. To activate the debug mode press the button with Green and Red arrows.
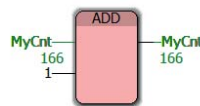
14. To be able to do some additional changes to the program, switch off the Debug mode. To make some changes in the Project tree on the left side of the screen it is also neccessary to close the Project Control dialog.

Now display the value of variable MyCnt on the built-in display of OMC 8000. It is as simple as programming the counter. You will need function block called DrawString and font selection functions - these functions are parts of the Graphic_Lib library and function called INT_TO_STRING belongs to string functions. Correct syntax for string formatting function can be found in Help file for this function. You can activate the Help Content from the context menu simply by pressing the right mouse button on the Function / Function Block (DrawString in this case) to see the context menu.

WEBSERVER, FTP, VNC

WEBSERVER

The current version of the webserver enables the user to display and set values using the http: protocol.

Access to the site is protected by username "OM", which is pre-filled, and by password, which is user selectable.

The space for a password is left out blank and needs to be filled in.

Up to 4 users can log on at the same time using the same username and password.
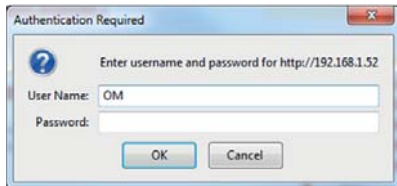
You can manage passwords using the Settings link at the bottom of the page.
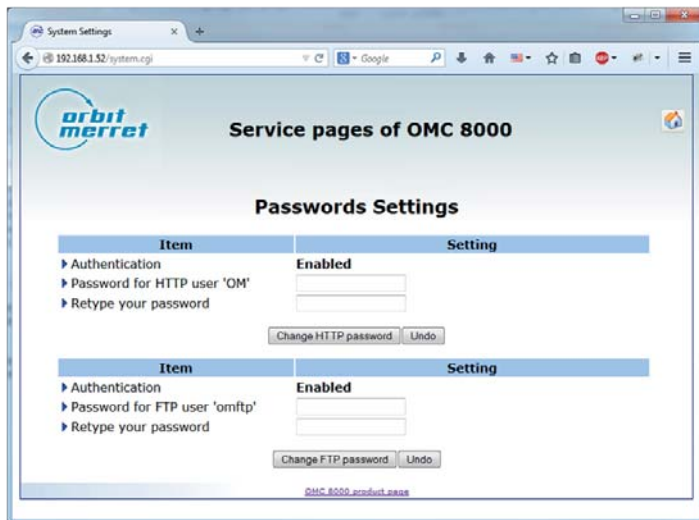
Main page "index.cgi" displays data page by page according to the POU in which they are created. Global variables are presented on the front page. A periodic refresh every 500 ms can be activated or a refresh can be executed manually.

In the global variables a **WebTitle** type STRING can be created. It will appear as the title of the page. If it is not created, the **Data page of OMC 8000** will be shown.

Each POU , including global variables may contain **PageTitle** type STRING will appear as the name of the page. If absent, the **name of POU** instance is displayed. Only in case of global variables instead of @GV it will be **Global**.

A variable, which is to be accessible on the webserver, must have the option designation PDD (Process Data Domain) marked. A PDD.CSV file will be attached to the project. It contains information on the marked variables.

For webserver operation four data types are defined - structures that describe complex components.

These may be displayed as:

1] variables of basic types and string type. The name and value of the variable is displayed.
2] Variables with defined range and with a horizontal bargraph INT_LIMITED a REAL_LIMITED
3] Measuring instrument of several types GAUGE_INT a GAUGE_REAL

```
TYPE
   INT_LIMITED :
      STRUCT
         VALUE: INT;
         MINVAL: INT;
         MAXVAL: INT;
         COLOR: UDINT;
      END_STRUCT;
END_TYPE


TYPE
   REAL_LIMITED :
      STRUCT
         VALUE: REAL;
         MINVAL: REAL;
         MAXVAL: REAL;
         COLOR: UDINT;
      END_STRUCT;

END_TYPE
```

```
TYPE                                    TYPE
   INT_GAUGE:                              REAL_GAUGE:
      STRUCT                                  STRUCT
         VALUE: INT;                             VALUE: REAL;
         MINVAL: INT;                            MINVAL: REAL;
         MAXVAL: INT;                            MAXVAL: REAL;
         MODE: INT;                              MODE: INT;
         COLOR: UDINT;                           DP: INT;
   END_STRUCT;                                   COLOR: UDINT;
END_TYPE                                   END_STRUCT;
                                        END_TYPE
```
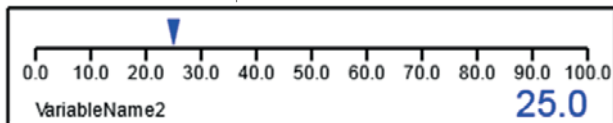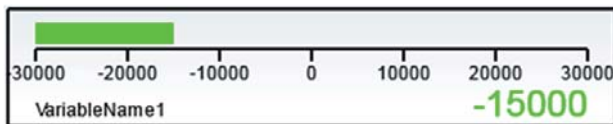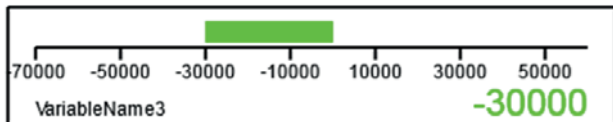
Mode

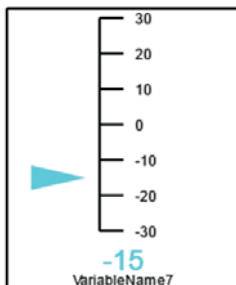**0** or **2** - horizontal scale with a pointer

1 - horizontal bargraph starting from minimum
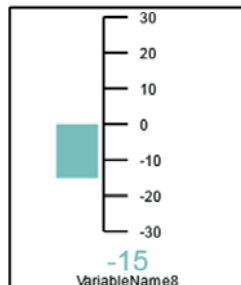

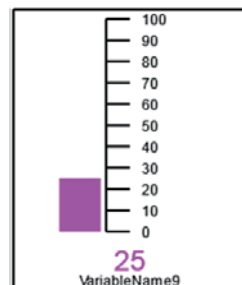**3** - symmetrical horizontal bargraph with zero in the centre

4 or **6** - vertical scale with a pointer

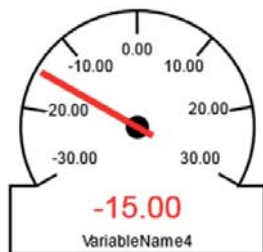**5** - vertical bargraph starting from minimum

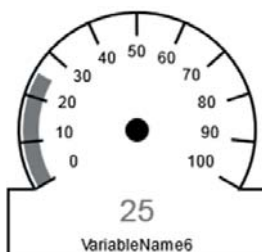**7** - vertical bargraph symmetrical starting from zero

8 or **10** - circular dial with a hand

9 - circular bargraph starting from minimum

11 - circular bargraph symmetrical with zero in the centre
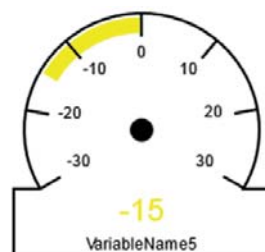
DP: (decimal places), the number of decimal places for measuring instruments type **REAL**
Color: **udint#16#00RRGGBB**, where **RR** is 00 up to **FF** for red, **GG** for green, **BB** for blue

If a variable ends with **_RW** it is up to date and its value can be sent out
If a variable ends with **_W,** its value can be sent out, but there is no update

_W/_RW cannot be of xxxx**_GAUGE**
_W/_RW type real executes the exchange of symbol „‚' (comma) by symbol ‚.' (full stop), which is required.
If the type is **REAL_LIMITED**, then the range of entered values is checked and also if a number was entered.

VNC

VNC Viewer SW (version 5 and higher) produced by Real VNC can be used for remote projection of PLC display.
This version can also resize the transmitted screen, which is only 160 x 128 pixels. If resizing is not required, earlier version of the SW can be used.
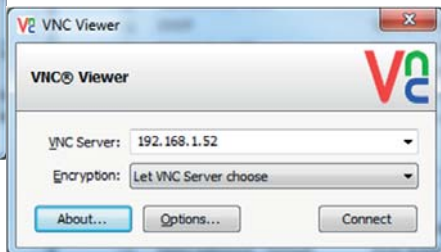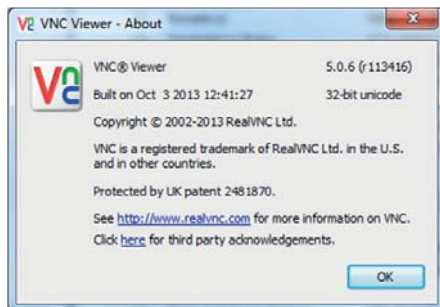
Default size   Enlarged size
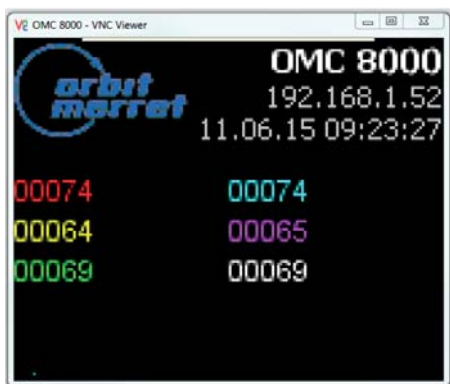
Program VNC Viewer can also be used to control the menu, provided menu is open in the PLC. It cannot be opened remotely. VNC server activates the display, in case it had been deactivated by either screen saver or by program.

FTP
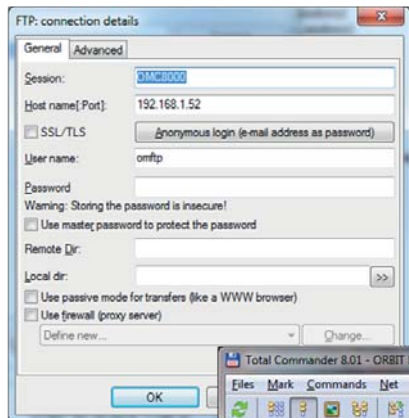
The second generation of OMC 8000 contains an FTP server, which allows 1 client to connect..

It provides access to both drives
M: SD card
N: internal NAND Flash
as virtual directories M and N.

Access to these pages is protected by username „**omftp**", which is fixed and by a password, which is user selectable. The default password is „**omftp**".

MEASURING INPUTS

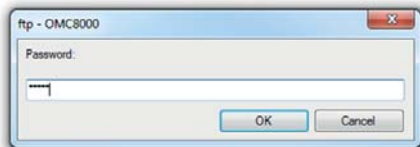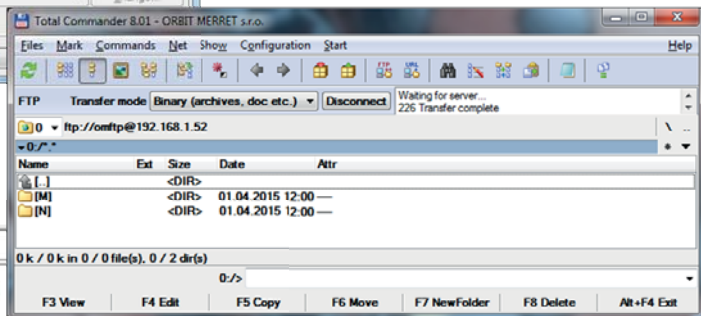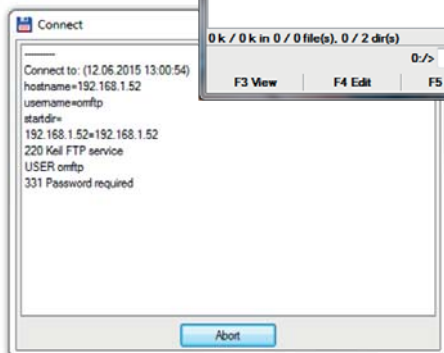|		
ANALOGUE/DIGITAL	Number of inputs	6
	Range	0…60/450 mV 0…2,8/10/20/30 V 0/4…20 mA 0…390/3900 Ω Pt 100 Pt 1 000/Ni 1 000 T/C - J/K/T/E/B/S/R/N/L PNP/NPN/contact (0,5 kHz) IRC (500 kHz), (2x)
	Resolution	12 bit
	Accuracy	±0,4 % of the range
	Measuring speed	1 000 measurements/s
	Overload	10x
	Signaling LEDs	yes
DIGITAL	Quantity	3
	Range	12…30 V AC/DC or 80…250 V AC (range always corresponds to the instruemnt's power supply)
	Max. current	2,5 mA
	Response time	20 ms
	Signaling LEDs	yes

TECHNICAL SPECIFICATION

TC	50 ppm/°C
Task	1 ms
Overload	10x (t < 30 ms), 2x
Projection	colour TFT display 160 x 128 poits life of 20,000 hours
Communication	ETHERNET 100Base UDP, VNC, HTTP, FTP MODBUS over TCP (Master/Slave)
Intermodule commun.	CANBUS with speed of 1 Mbit/s at a distance of 40 m
Slot for microSDcard	yes, max 32 GB
Memory	internal NAND 512 MB
Watch-dog	reset after 500 ms
Calibration	at 25°C and 40 % r.h.

COMPARATOR

Type	digital
Function	ON/OFF PWM (10 kHz) only for open collectors
Outputs	5x relay with switch on contact (Form A), (250 VAC/24 VDC, 10 A)* 5x open collector, (30 VDC/300 mA)*
Reaction time	< 8 ms (relay)/0,15 ms (OC)
Relay	1/8 HP 277 VAC, 1/10 HP 125 V, Pilot Duty D300
Signaling LEDs	yes

* values valid for resistive load

DATA OUTPUT

Protocol	ASCII, MODBUS RTU (Master/Slave), Universal
Data format	8 bits + no parity + 1 stop bit
Rate	600…230 400 Baud
RS 485	galvanic connection with inputs with addresses (max. 31 devices)

ANALOGUE OUTPUT

Type	galvanic isolated, programmable with a 16 bit D/A convertor
Non-linearity	0,1 % of the range
TC	15 ppm/°C
Speed	response to input value < 1 ms
Output	0…2/5/10 V, ±10 V, 0…5 mA, 0/4…20 mA (compensation < 500 Ω/12 V)
Ripple	5 mV residual ripple at output voltage of 10 V

When analogue output is on board, no. of relay/OCs is reduced to 3 units

POWER SUPPLY

	12…30 VDC/24 VAC, ±10 %, 5 VA, PF ≥ 0,4, 100…250 VDC/VAC, ±10 %, 5 VA, PF ≥ 0,4, I_{STP} < 40 A/1 ms, galvanic isolated

MECHANICAL PROPERTIES

Material	PA 66, incombustible UL 94 V-0, blue
Dimensions	72 x 91 x 60 mm
Mounting	to DIN rail, 35 mm wide

OPEARTING CONDITIONS

Connection	Screw terminals, cross section < 2,5mm²
Stabilisation perid	up to 15 minutes after power-on
Operating temperature	-20°…60°C
Storage temperature	-20°…85°C
IP rating	IP40
Execution	Safety class I
El. safety	EN 61010-1, A2
Dielectric strength	4 kVAC for 1min. between power supply and input 4 kVAC for 1min. between power supply and data bus 4 kVAC for 1min. between power supply and data/analogue output 4 kVAC for 1min. between input and relay output 2,5 kVAC for 1 min. between input and data/analogue output
Isolation resistance	for pollution degree II, measuring cat. III. 300 V (SI), 150 (DI)
EMC	EN 61326-1 (Industrial area)
Programming	EN 61131-3

* SI - Single isolation, DI - Double isolation

NOTES

Product	**OMC 8000**
Type	. . . .
Serial number	. . . .
Date of sale	. . . .

A warranty period of 60 months from the date of sale to the user applies to this instrument.
Defects occuring during this period due to manufacture error or due to material faults shall be eliminated free of charge.

For quality, function and construction of the instrument the guarantee shall apply provided that the instrument was connected and used in compliance with the instructions for use.
The warranty shall not apply to defects caused by:

- mechanical damage
- transportation
- intervention by unqualified person incl. the user
- unavoidable event
- other unprofessional interventions

Warranty and post warranty repairs are performed by the manufacturer, unless provided for otherwise.

Stamp, signature

EU DECLARATION OF CONFORMITY

Company: **ORBIT MERRET, spol. s r.o.**
Klanova 81/141, 142 00 Prague 4, Czech Republic, VAT No. CZ00551309

Manufacturer: **ORBIT MERRET, spol. s r.o.**
Vodnanska 675/30, 198 00 Prague 9, Czech Republic

declares at its sole responsibility that the product presented hereunder meets all technical requirements, is safe for use when utilised under the terms and conditions determined by ORBIT MERRET, spol.s r.o. and that our company has taken all measures to ensure conformity of all products of the types referred-to hereunder, which are being brought out to the market, with technical documentation and requirements of the appurtenant Czech statutory orders. The object of the declaration is in conformity with the relevant Union harmonisation Legislation.

Product: Programmable logical and measuring controler

Type: **OMC 8000**

Thas been designed and manufactured in line with requirements of:

Low-voltage electrical equipment (directive no. 2014/35/EU)
Electromagnetic compatibility (directive no. 2014/30/EU)

The product qualities are in conformity with harmonized standards:

El. safety: EN 61010-1
EMC: EN 61326-1
          Electronic measuring, control and laboratory devices – Requirements for EMC "Industrial use"
          EN 50131-1, chap. 14 and chap. 15, EN 50130-4, chap. 7, EN 50130-4, chap. 8, (EN 61000-4-11, ed. 2)
          EN 50130-4, chap. 9 (EN 61000-4-2), EN 50130-4, chap. 10, (EN 61000-4-3, ed. 2), EN 50130-4, chap. 11 (EN 61000-4-6)
          EN 50130-4, chap. 12, (EN 61000-4-4, ed. 2), EN 50130-4, chap. 13 (EN 61000-4-5), EN 61000-4-8, EN 61000-4-9,
          EN 61000-6-1, EN 61000-6-2, EN 55022, chap. 5 and chap. 6

Seismic capacity: IEC 980: 1993, par.6
PLC: EN 61131-2:2003

The product is furnished with CE label issued in 2012

As documentation serve the protocoles of authorized and accredited organizations:
EMC   MoD, Testing institute of technical devices, protocol no. 164/11-143/2012 of 24/08/2012
          MoD, Testing institute of technical devices, protocol no. 164/11-145/2012 of 24/08/2012
Seismic capacity   VOP CZ, s.p. Vyskov, protocol no.: 194200-212/2015 of 19/11/2015

Place and date of issue: Prague, 1st of April 2016   Miroslav Hackl
          Company representative