ELVAC RTU as Main Communication Unit in Power Industry

Usual application names:

- Main Communication Unit for Power Distribution or Power Transmission Objects
- Data Concentrator
- Communication Gateway
- Router
- Protocol Converter
- Redundant (Backup) Communication to SCADA

Location specification:

- primary substation high voltage to medium voltage (HV/MV),
- switching stations (power distribution network is only divided into more MV branches),
- secondary substation medium voltage to low voltage (MV/LV),
- renewable energy sources (water, wind, solar power plants),
- cogeneration units,
- other objects in power transmission and distribution (pole mounted reclosers, load break switches, indicators etc.).
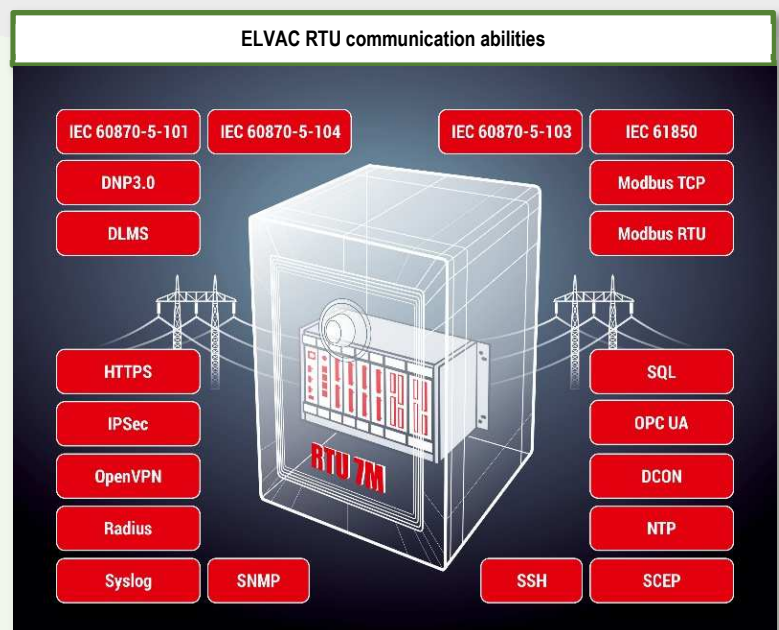
Typical application demands:

- communication with SCADA system via optical or metallic Ethernet, GSM/UMTS/LTE or radio modem,
- communication protocols:
  - to SCADA - IEC 60870-5-101, IEC 60870-5-104, DNP3, IEC 61850,
  - to other electronic devices in object - IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, IEC 61850, DNP3, MODBUS TCP/RTU, DLMS, sometimes others, when retrofits are demanded,
  - secured communication, communication tunnels etc.,
- data concentration from other electronic devices – protection relays, energy meters, fault passage indicators, power quality meters.
- HMI.

Note: As the standards may vary from country to country, your demands can be always discussed with our professionals.

ELVAC RTU system description

Above mentioned applications are related mainly to the system communication abilities. For ELVAC RTU systems, there were developed communication cards from series COMIO. They are available in the following versions:

COMIO4 – basic type of communication card, focused on small systems with low price. It offers up to 4 communication interfaces in different combinations. Its internal resources allow to use maximally up to 5 additional RTU cards or devices in whole system. This card supports communication protocols IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, DNP3 to SCADA, MODBUS RTU/TCP, HIOCom2, HTTP. This card does not support encryption (e.g. https is not supported).

ELVAC RTU communication abilities

IEC 60870-5-101 · IEC 60870-5-104 · IEC 60870-5-103 · IEC 61850 · DNP3.0 · DLMS · Modbus TCP · Modbus RTU · HTTPS · IPSec · OpenVPN · Radius · Syslog · SNMP · SQL · OPC UA · DCON · NTP · SSH · SCEP · RTU 7M

COMIO PC3 – third generation of communication card based on Linux core. This card offers much higher performance than COMIO4, so it supports wider range of communication protocols used in power industry, see the picture above with ELVAC RTU communication abilities. This card is available in one or two-slot versions with various number on communication interfaces and its combinations, see the ELVAC catalogue for power industry. As the card performance is very high, it has sufficient internal resources for evaluation of data from much higher number of additional RTU cards or external devices, which is usually sufficient for the largest existing applications in power industry. This card also supports the secured communication demanded by actual IT standards in power industry, routing and Firewall function. ELVAC RTU then combines standard RTU functions with wide communication functions. And wise versa, when this card is used only with RTU7M power supply cards in small chassis, it can be used as main communication unit with optional communication interfaces combinations and with optional power supply input voltages (10 – 220 V DC or 80 – 230 V AC) including optional battery backup.

RTU7MC3 – standalone communication device with the same communication features as above mentioned COMIO PC3. The main differences are, that RTU7MC3 has fixed communication interfaces combination 2 x RS-232/422/485, 2 x Ethernet LAN, 1 x GSM/GPRS/LTE modem and as a standalone device is mounted in DIN rail or panel mounting chassis, it has 24 V DC power supply and 1 x DI.

Detailed technical specifications can be found in our catalog of products for power industry. The parameterization of all above mentioned cards/devices can be done either through web interface or via ELVAC parameterization software RTU User Center, which is free of charge.

COMIO PC3 and RTU7MC3 features:

- variety of communication ports with support for all state-of-art standards in power distribution control,
- multiple communication support with upper systems (SCADA, maintenance, communication backup),
- multiple APN support (on demand),
- two independent network interfaces (useful for Firewall function or networks separation),
- supported communication protocols – IEC 61850, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, DNP3, MODBUS TCP/RTU, DLMS, OPC UA, SNMP, HIOCom2,
- L2TP, OpenVPN and IPSEC tunneling,
- secured communication according to IEC 62351-3 (TLS),
- web based configuration interface HTTP/HTTPS,
- NAT, Firewall functionality,
- user access control, RADIUS,
- Syslog, NTP, SSH, SCEP,
- SQL database connector available,
- user programmable automation functions according to standard IEC 61131-3 (embedded PLC),
- built-in RTC,
- internal microSD socket for storage expansion,
- web interface for configuration and custom interactive HMI (modern web browsers on Windows/Android/iOS are supported).

RTU7MC3

ELVAC RTU communication roles for different applications

As our communication units and cards in ELVAC RTU systems have many functions, so there is not usually used only one function, but they can be used simultaneously. Then RTU system can be understood as:

- **Main Communication Unit** – when it is main communication device between power distribution object and SCADA systems (or others),
- **Data Concentrator** – when it concentrates data from many devices in power distribution object, usually from I/O cards and other RTUs in large systems, energy meters, protection relays, power quality meters etc.,
- **Communication Gateway** – when it offers communication services for other devices, which do not have communication interfaces (for example devices with digital outputs only, like various fault indicators, energy meters, switches etc.) or their communication protocols or interfaces are not optimal for communication with SCADA system,
- **Router** – when it separates two networks for higher communication security, usually the communication with SCADA and local network in power distribution object,
- **Protocol Converter** – when data from devices in power distribution object coming through some communication protocol are converted into other protocol usually used with SCADA and other upper systems, like IEC 870-5-101 to IEC 870-5-104, MODBUS to IEC 870-5-104 or IEC 61850, or IEC 61850 to IEC 870-5-104 and other combinations,
- **Redundant Communicator** – when there are created backup communication lines for communication with SCADA or there can be created separate communication lines into more SCADA systems or other system (e.g. a maintenance system).

All above mentioned roles can be combined in ELVAC RTUs using the communication card COMIO PC3 or RTU7MC3 without any limitations. Some communication features (IEC 61850, DLMS, SQL connector) are licensed. The products with communication card COMIO4 are used for easier tasks, like protocol conversion, because of its limited internal resources. The typical device for basic protocol conversion or communication gate is smallest RTU in our portfolio – RTU7C.

Configuration example 1

This is an example of configuration for substation, combining all above mentioned communication roles. Usually one RTU unit has the function of main communication RTU and data concentrator. If there are another RTUs, they are subordinated to the main communication unit. This situation is also described in more details in document "ELVAC_RTU in Primary Substation".
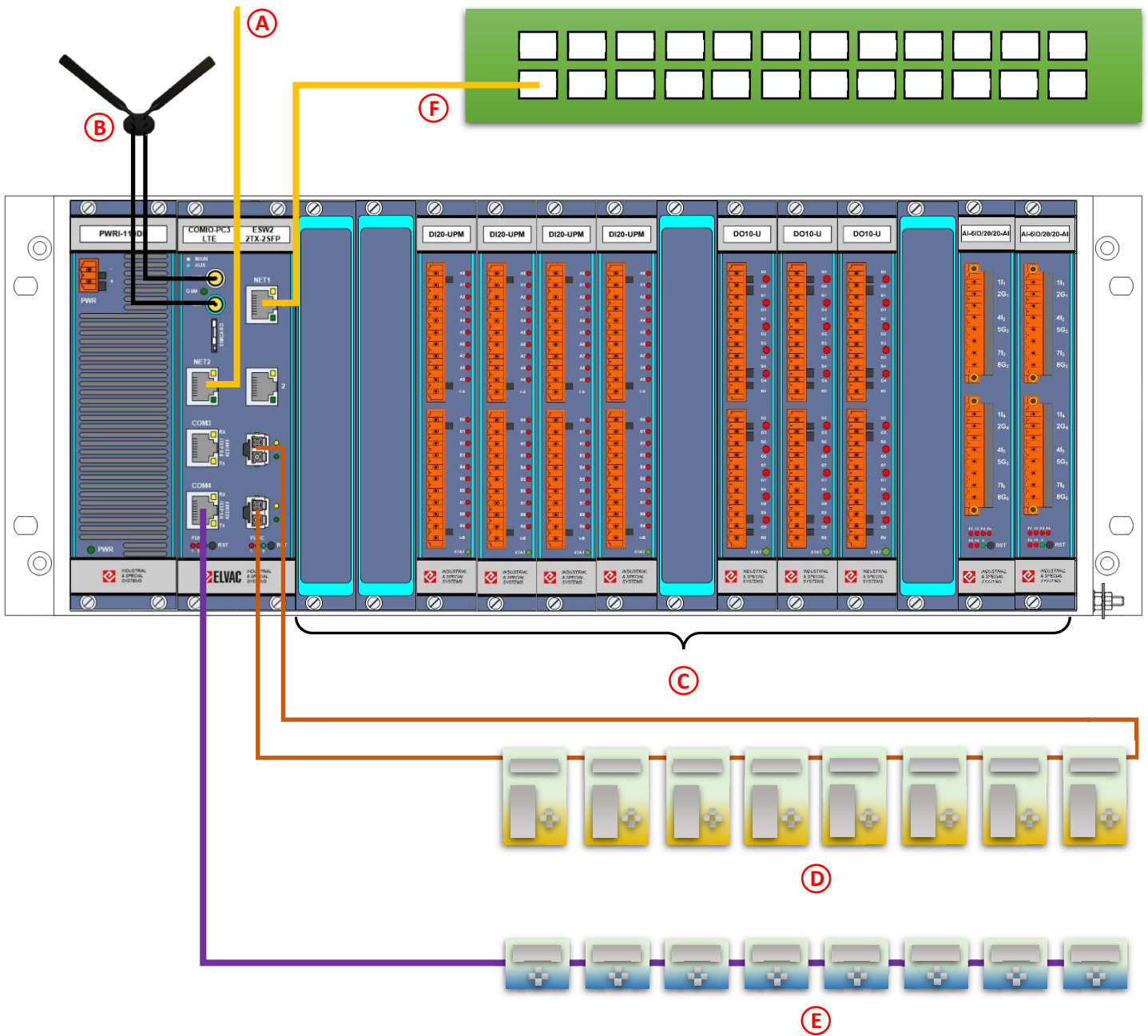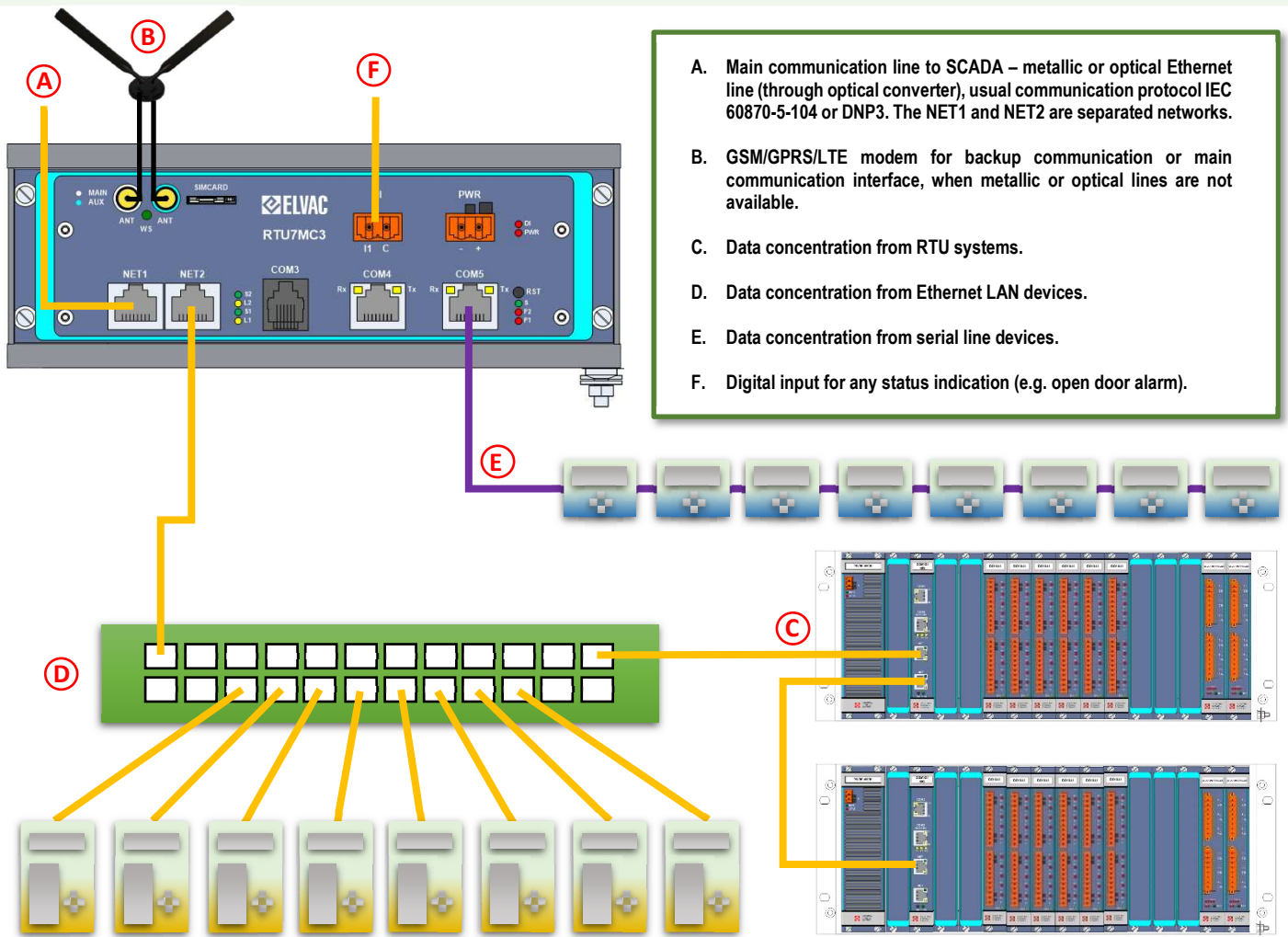

A. **Main communication line to SCADA** – metallic or optical Ethernet line (through optical converter), usual communication protocol IEC 60870-5-104 or DNP3.

B. **Optional GSM/GPRS/LTE modem** for backup communication or main communication interface, when metallic or optical lines are not available.

C. **Data collection from internal I/O cards in RTU.** It is also possible to collect the data from energy meters through pulse counter at digital inputs in our RTU systems.

D. **Data concentration from protection relays** via optical ring (optionally metallic ring), usual communication protocols IEC 61850, MODBUS TCP, IEC 60870-5-104.

E. **Data concentration from other devices** (energy meters, power quality meters) via serial line.

F. **Data concentration from other devices** (another RTUs, energy meters, power quality meters) via Ethernet switch.

Configuration example 2

This is an example of standalone unit RTU7MC3 as main communication unit in power distribution applications. It works also as router, protocol converter and data concentrator.

A. **Main communication line to SCADA** – metallic or optical Ethernet line (through optical converter), usual communication protocol IEC 60870-5-104 or DNP3. The NET1 and NET2 are separated networks.

B. **GSM/GPRS/LTE modem** for backup communication or main communication interface, when metallic or optical lines are not available.

C. **Data concentration from RTU systems.**

D. **Data concentration from Ethernet LAN devices.**

E. **Data concentration from serial line devices.**

F. **Digital input for any status indication** (e.g. open door alarm).

Configuration example 3

This is an optional configuration of the previous example no. 2 assembled from modular RTU7M. Comparing to example 2, the main difference is an optional power supply card, so the unit can be directly powered from wide range of powering voltages from 10 – 220 V DC (which enables the direct powering from any battery system in substation) or 80 – 230 V AC. Another optional component is a communication card, where, for example, a GSM/GPRS/LTE modem can be integrated or not. The typical usage of this configuration is protocol IEC 61850 converter in substations, or main communication unit with data concentration and routing functions.

ELVAC RTU certificates:

- Electrical safety – EN 61010-1, 60255-27, 60950-1
- EMC – EN 61000-4-xx, 61000-6-5, 50130-4, 60255-26
- EMI – EN 55022, 55032
- Environment – EN 60068-2-xx
- Certified protocols:
  - ✓ IEC 60870-5-104
  - ✓ IEC 61850
- Security – Penetration Tests
- ISO 9001, 14001, 18001, 27001