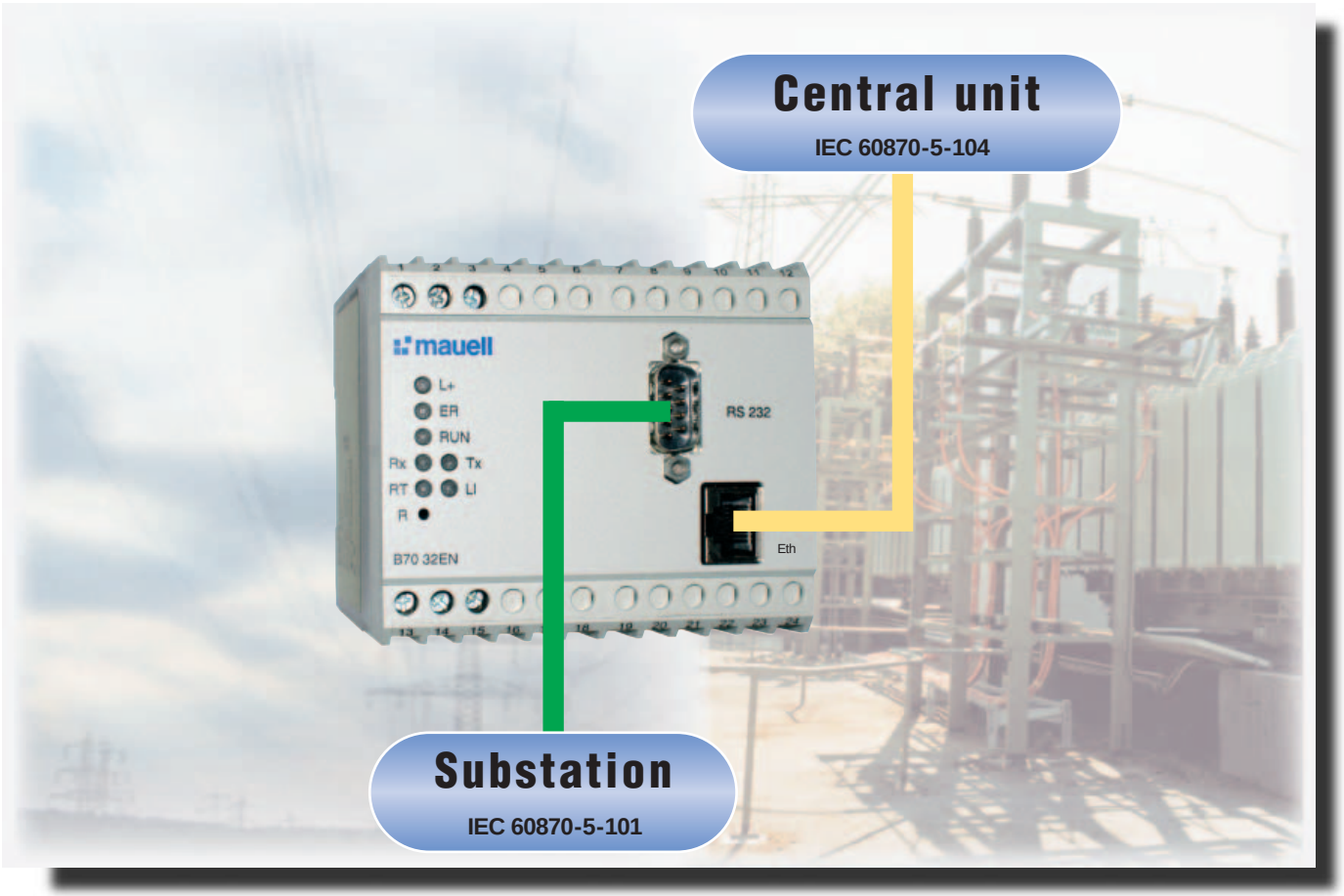
Protocol Converter IEC 60870-5-104 (Ethernet) to IEC 60870-5-101 (RS 232)



The protocol converter -104/-101 is the connecting link between a central unit/master computer with IEC 60870-5-104 interface and a substation/telecontrol node with IEC 60870-5-101 interface.

Features

- ***IEC 60870-5-104 (Server) protocol interface*** for the connection to a central unit/master computer. Up to 8 redundant protocol connections can be established simultaneously. Connection by means of a floating RJ 45-Ethernet interface (10/100Mbits/sec).
- ***IEC 60870-5-101 protocol interface*** for the connection to a substation by means of a floating RS232 interface (300 to 38,400 bauds). You can choose between the operating modes "Balanced transmission" and "Unbalanced transmission".
- ***Conversion function for the user data*** transmitted between the protocol interfaces (e.g., message types, time marks, etc.)
- ***Network administration,*** either automatic based on the DHCP protocol, or as fixed setting (IP, subnet, gateway)
- ***Integrated clock module*** with 24 hours reserve power for the time synchronization of the connected substation. The clock module is synchronized over the network (NTP or IEC 60870-5-104).
- ***Parameter definition/diagnosis function*** implemented over the integrated Web server using a standard Web browser.
- ***Device documentation and User's manual*** are available as PDF documents and can be loaded via the device's Web server.
- ***Access control*** to protect against unauthorized use/interference. Protocol connections of the -104 interface can only be established by remote stations that can be allocated through their IP address in the protocol converter. Access to the Web server requires prior authorization.
- ***Self-monitoring function:*** hardware watchdog and monitoring of the module supply voltage.
- ***LED indication*** of the voltage supply (L+), sequential program (RUN) and detected faults (ER), and send/receive indication of the Ethernet (RT/LI) and RS232 (RX/TX) interfaces.
- ***Fault alarm contact*** with floating relay output (working current, closed-circuit current)
- ***Reset button*** (concealed) for manual reset or loading the factory settings
- ***Software updating*** over the network connection.

Principle of Operation

The protocol converter -104/-101 represents the connecting link between a central unit/master computer with IEC 60870-5-104 interface (hereafter abbreviated to '-104') and a substation/telecontrol node with IEC 60870-5-101 interface (hereafter abbreviated to '-101').

The ***connection of the substation*** is established over the RS232 interface using the IEC 60870-5-101 protocol. You can choose between the operating modes "Balanced transmission" and "Unbalanced transmission". At unbalanced transmission, the substation takes over the role of the slave unit, the protocol converter that of the master unit.

The converter supports the use of VFT equipment and leased line modems for two-wire operation (half duplex) and four-wire operation (full duplex).

The ***connection of the central unit*** is established over the Ethernet interface using the IEC 60870-5-104 protocol. The central unit acts as the client unit, the protocol converter as the server unit. Up to 8 clients can simultaneously establish a (redundant) connection to the server. All protocol connections are processed simultaneously and independently of each other. In the monitoring direction, all data is transmitted to all subscribers in accordance with the clients' control instructions (Start_Data, Stop_Data). There will be no interlocking of clients with respect to each other in the control direction.

The protocol converter's main task is to provide a protocol conversion that remains as far as possible transparent to both the substation and the central unit. None of the communicating devices is able to notice that the connection to the other device is not a direct connection.

The buildup of a connection is always initiated by the central unit (client-104). It contacts the server -104 in the protocol converter which then establishes a -101 connection to the substation. If the -101 connection is successfully established, the -104 connection is acknowledged and data can then be exchanged between the substation and the central unit.

The connection is cleared by the central unit or if the -104 transmission is interrupted. When the -104 connection is terminated, the protocol converter also terminates the - 101 connection.

In the event of a ***line interruption*** during the -101 transmission between the protocol converter and the substation the protocol converter terminates the -104 connection to the central unit.

Owing to the operational behavior described above, both the central unit and the substation will always know whether a connection to the remote station has actually been established or not.

The protocol converter uses ***Data flow control*** to coordinate the different transfer rates of the -101 and -104 interfaces.

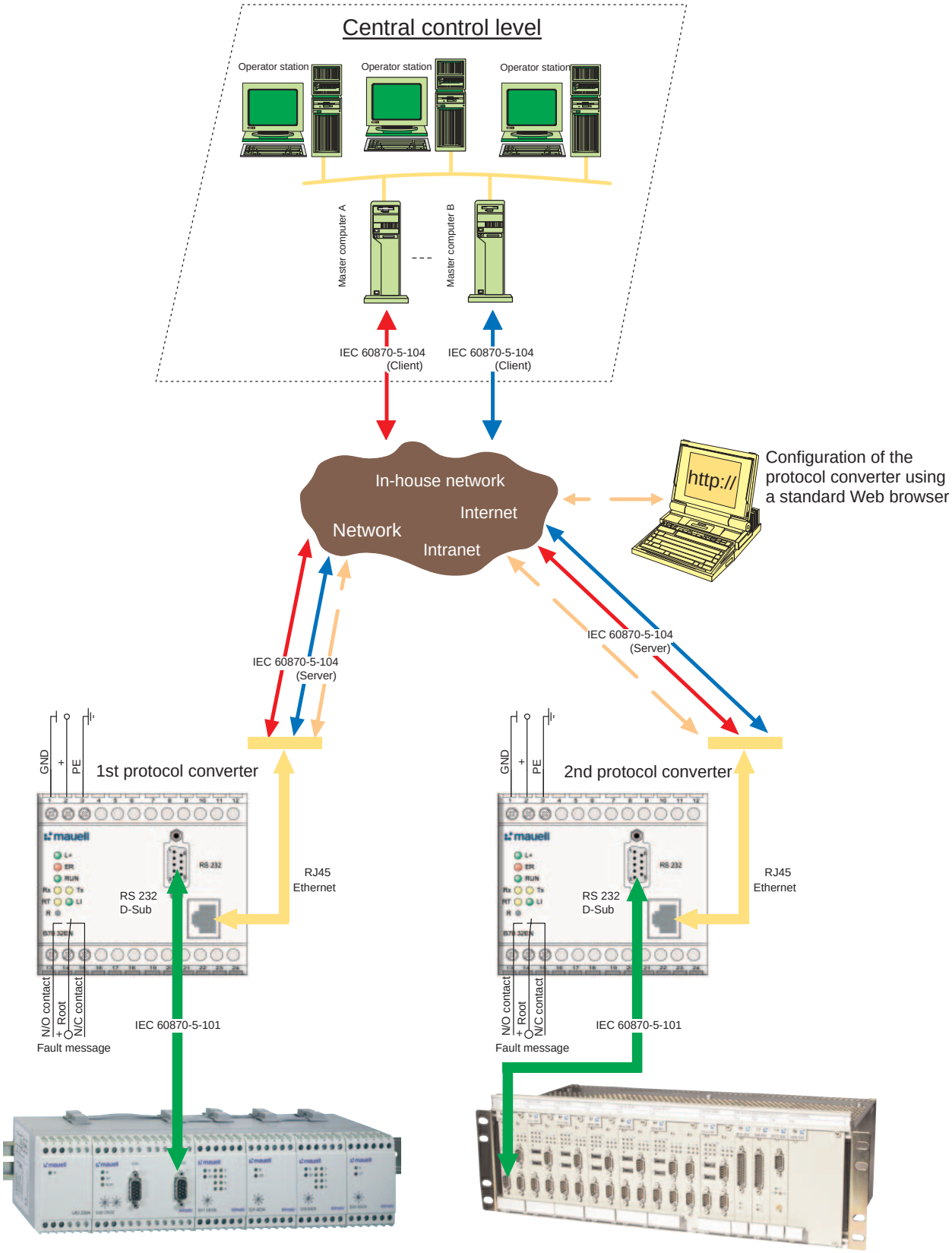
The ***conversion function for the user data*** transmitted between the protocol interfaces levels out any differences that might occur between the -101 and the -104 interfaces.

A conversion of the addresses is necessary due to the fact that the -101 uses scalable addressing and the -104 fixed addressing.

The scope of possible type identifiers in the standard specification of the -104 has been modified, as compared to that of the -101. New identifiers have been added, others removed as they no longer apply. The protocol converter converts unrecognized type identifiers into compatible ones. Different time mark formats are correctly converted.

A ***time-of-day transmission to the substation*** via the -101 interface is implemented. For this purpose the protocol converter has an integrated clock module with 24 hours reserve power. The clock is cyclically synchronized over the network (NTP or -104). The protocol converter offers the option of generating a time synchronization sequence at 1-minute intervals for the -101 device.

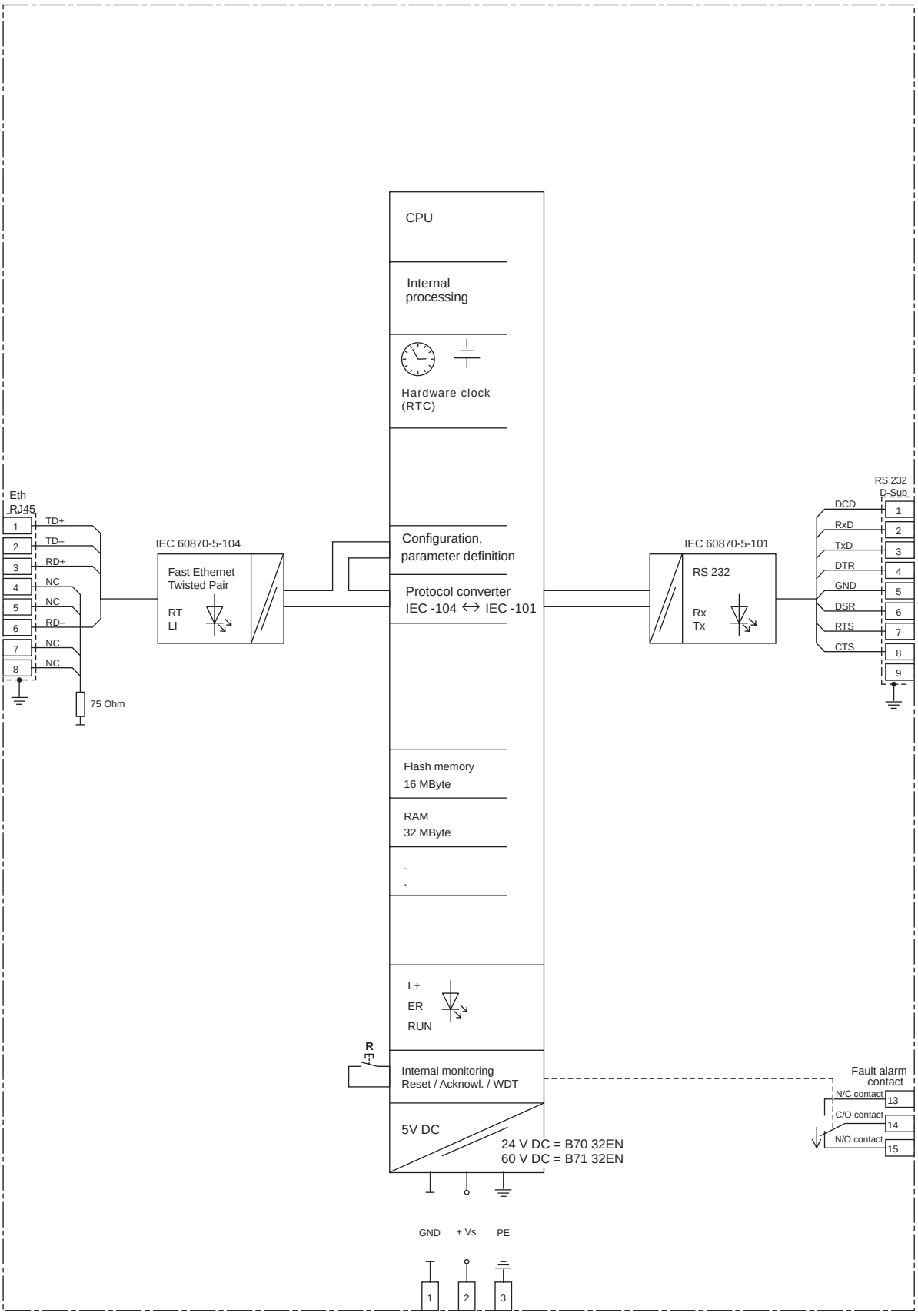
Application Example



Substation, e.g., ME30 *telmatic*

Telecontrol node, e.g., ME 8018 K

Block Diagram



Technical Characteristics

Supply voltage

B70 32EN 30-96-901	+ 24 V ± 20 %, 130 mA typ.
B71 32EN 30-96-902	+ 60 V ± 20 %, 55 mA typ.
Mains buffering	≤ 50 ms every ≥ 30 s

RS 232 interface

Transfer rate	300 to 38,400 bauds definable

Ethernet interface

Transfer rate	10 / 100 Mbits / s
Fault alarm contact	0.1 - 250 V AC / DC, 60 W / 125 VA

Cable groups

RS 232	01-35-405A
Ethernet	06-21-347

Replacement parts

Cover Sub-D plug connector 9-pin (EMC)	01-69-631

Noise immunity

DIN EN 61000-4-2: 96-03	ESD; 8 kV indirect contact discharge, 4 kV direct contact discharge 4 kV air discharge
DIN EN 61000-4-3: 99-06	EM-RF field and EM-RF field for digital radiophones; 10 V / m
DIN EN 61000-4-4: 96-03	Burst; 2 kV
DIN EN 61000-4-5: 96-09	Surge; 500 V symmetric, 1 kV asymmetric
DIN EN 61000-4-6: 97-04	RF inflow 3 V
DIN EN 61000-4-8: 94-05	50 Hz magnetic fields; 3 A / m continuous field, 30 A / m short duration

Interference emission

DIN EN 55011: 97-10	
VDE 0875-11	Radio noise emission; Group 1, Class A

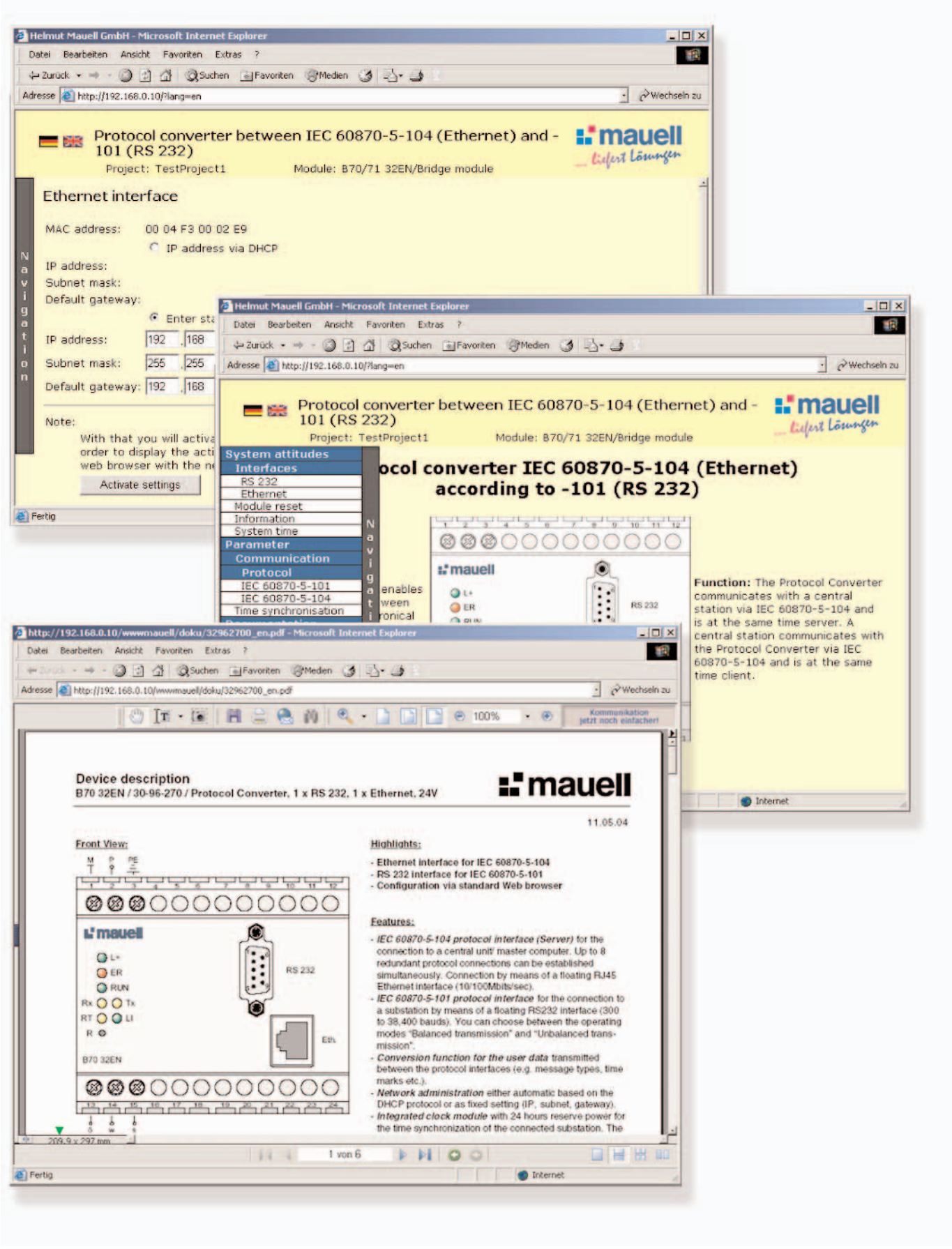
Other standards

IEC 255-5: 1977	Electric strength; 1 kV DC and 1 kV surge
Protection class DIN 40050 and IEC 529	Terminals IP20 Housing IP40
Ambient temperature range	0 °C to 50 °C
Relative air humidity	≤ 75 % at annual average ≤ 95 % for 30 days at 30 °C moisture condensation not permissible during operation

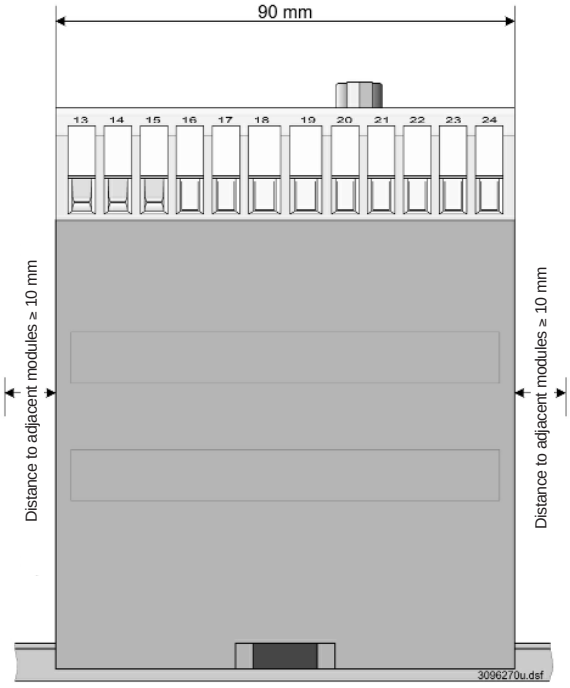
Mechanical characteristics

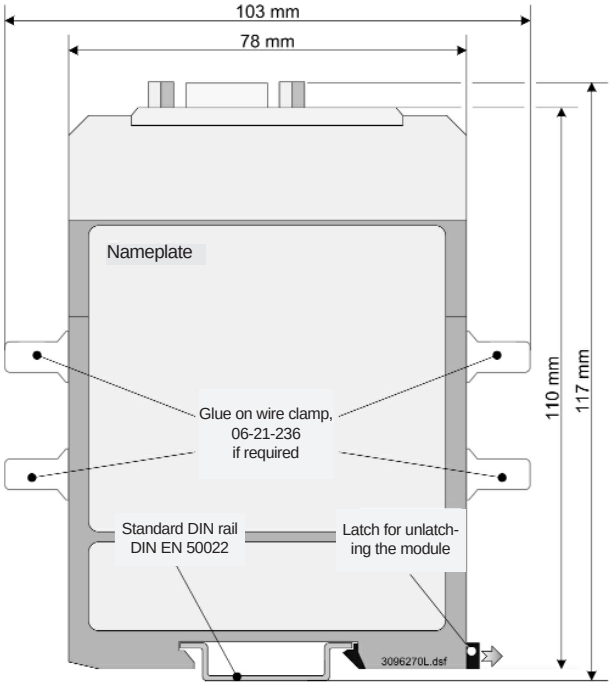
Housing for DIN rail mounting Width x Height x Depth	90 mm x 78 mm x 116 mm

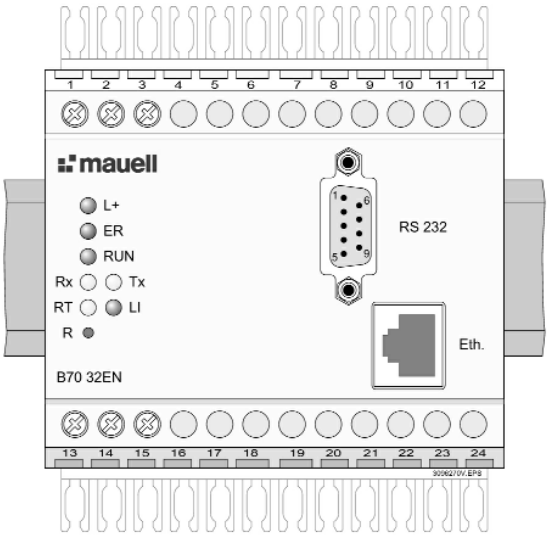
Web-based Parameter Definition and Documentation



Dimension Drawing







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