# Mobile Control System

Master Module
Series ELMR 221



- electrical data and equipment is optimised for use in the mobile industry
- programming to IEC 61131-3
- detection of under- and over-voltages
- diagnostic functions for software and hardware
- outputs are protected against short-circuits and over-loads; can be examined by diagnostics
- RS232 serial interface
- CAN-Bus (master) with CANopen protocol
- automatic, and program-controlled, data storage in flash EPROM

## 1 Description

The ELMR221 master module is used as a controller in Bucher CAN bus systems. The module has 4 power outputs that can be suitably configured. The features of the operating system, which was specially developed by Bucher Hydraulic, enable customer applications to be developed in significantly shorter time-scales. The operating system represents the intelligence and functionality of the complete electronic system. It includes interface communications, parameterisation, configuration, I/O processing, recording/ data logging and parameter-driven control algorithms (e.g. for controlling synchronous motion). The operating system is in use in numerous applications and is therefore robust, and proven to a high degree.

### 1.1 Designed for

- the extreme mechanical stresses that result from impacts and shock loadings
- low and high ambient temperatures while in operation
- the direct effects of dirt, water and dampness during field service
- the large voltage fluctuations that are found in battery/alternator systemse
- severe interference effects, whether radiated or conductor-linked, on the entire electrical system

## 2 Technical data

### 2.1 Can be used as CANopen master or intelligent I/0 module
8 inputs (4 digital/ 4 analog) and 4 outputs (digital/ PWM/ current-controlled)

| Characteristics | Description, value, unit |
|---|---|
| Housing | closed screened metal housing with flange fastening |
| Dimensions (l x w x h) | 132 x 43 x 153 mm |
| Mounting | by means of 4 M5 x L screws to DIN 7500 or DIN 7984<br>mounting position horizontal or vertical to the mounting wall |
| Connection | 55-pin connector, latched, prot. against reverse polarity; type AMP housing or Framatome; AMP junior timer contacts, crimp connec. 0,5/2,5 mm$^2$ |
| Weight | 0,95 kg |
| Inputs | 8 |
| Outputs | 4 |

Reference: 100-P-700054-E-01

# BUCHER hydraulics

| Characteristics | Description, value, unit |
|---|---|
| can be configured as | 4 digit.; for pos. sensor signals (Low-Side); NAMUR; with diagnostic capability incl 2 pulse inputs (max. 50kHz); 4 analog; 0..10/32V DC or 0/4..20mA |
| can be configured as | digital, positive switching (High-Side); PWM (PWM frequency 20...250 Hz) current-controlled (0,1...4 A) |
| Switching current per output | max. 4 A |
| Total current of all output | max. 16 A |
| Operating voltage $U_B$ | 10 ... 30 V DC |
| Overvoltage | 36 V for $t \leq 10$ s |
| Reset in case of undervoltage | at $U_B \leq 9,5$ V |
| Auto save | at $U_B \leq 9,0$ V |
| Current consumption | $\leq 160$ mA (without external load) |
| Operating temperature | -40°C ... +85°C |
| Storage temperature | -40°C ... +90°C |
| Protection | IP 67 (protection for plug, depending on cable treatment) |
| CAN interface 1 | CAN interface 2.0 B, ISO 11898 |
| Baud rate | 10 kBit/s ... 1 MBit/s (default setting 125 kBit/s) |
| Communication profile | CANopen, CiA DS 301 version 3.0, CiA DS 401 version 1.4 |
| CAN interface 2 | CAN interface 2.0 B, ISO 11898 |
| Baud rate | 10 kBit/s ... 500 kBit/s (default setting 125 kBit/s) |
| Communication profile | SAE J 1939 |
| Serial interface | RS 232 C |
| Baud rate | 9,6 kBit/s, 19,2 kBit/s, 28,8 kBit/s |
| Topology | point-to-point (max. 2 participants); master-slave connection |
| Protocol | predefined ifm protocol (INTELHEX) |
| Node-ID (default) | hex 20 (= dez 32) |
| Processor | CMOS microcontroller 16 bits C167C; pulse frequency 20MHz |
| Device monitoring | undervoltage monitoring<br>watchdog function<br>check sum test for program and system<br>overload monitoring |
| Program memory | 192 Kbytes flash, can be used by the user |
| Data memory | 64 kByte SRAM, 32 kByte Flash, 3 kByte EEPROM |
| Data memory (protected in case of power failure) | 256 Kbytes (auto save memory) |
| Status LED | two-colour LED (red/green) |

| Operating status (status-LED) | LED colour | Flashing frequency | Desciption |
|---|---|---|---|
| if both faults occur simultan-eously, the LED appears orange. | - | constantly off | no supply voltage |
| | orange | for a short time on | initialisation or reset checks |
| | green | 5 Hz | no operating system loaded |
| | green | 0,5 Hz<br>2,0 Hz<br>constantly on | Run, CANopen: PREOPERATIONAL<br>Run, CANopen: OPERATIONAL<br>Stop, CANopen: PREPARED |
| | red | 0,5 Hz<br>2,0 Hz<br>constantly on | Run with error<br>(CANopen: PREOPERATIONAL)<br>Run with error (CANopen: OPERATIONAL)<br>Fatal error or stop with error |

| Elecrical connection | Description | Pin no. | Potential |
|---|---|---|---|
| To guarantee the electrical inter-ference protection of the controller, housing must be connected to the ground of thevehicle! | supply voltage | 23 | 10...30 V DC (VBB$_S$) |
| | supply voltage outputs | 05 | 10...30 V DC (VBB$_O$) |
| | ground | 01 | GND$_S$ |
| | CAN interface 1 | 14/51<br>32/50<br>33/15 | CAN_H<br>CAN_L<br>CAN_GND |
| | CAN interface 2 | 42/43<br>44/45<br>26/31 | CAN_H<br>CAN_L<br>CAN_GND |
| | RS 232 interface (programming) | 07 (TxD)<br>06 (RxD)<br>13 (GND) | Pin02, PC D-Sub (9 pin)<br>Pin03, PC D-Sub (9 pin)<br>Pin05, PC D-Sub (9 pin) |
| | "TEST" input<br>programming mode<br>operating mode | 24<br><br>24 | 10...30 V DC (VBB$_S$) open |

## 2.2 Characteristics of the inputs/ outputs

| Characteristics | Description, value, unit |
|---|---|
| Digital inputs<br>(%IX0.0 / 0.8 / 1.0 / 1.8)<br>can be configured as | Digital inputs for positive switching sensor signals<br>switch-on level $\qquad$ 0,7 $U_B$<br>switch-off level $\qquad$ 0,4 $U_B$<br>input resistance $\qquad$ 2,86 k$\Omega$<br>input frequency $\qquad$ 50 Hz |
| | NAMUR inputs; digital inputs with diagnostic capability when used with<br>ifm NAMUR sensor; supply voltage 5...25 V; e.g. NT5001...NN5002<br>input resistance $\qquad$ 2,86 k$\Omega$<br>input frequency $\qquad$ 50 Hz |
| | Diagnostic inputs (analog evaluation); digital inputs with diagnostic capability when an external resistor connection is used; corresponds to the NAMUR input<br>input resistance $\qquad$ 2,86 k$\Omega$<br>input frequency $\qquad$ 50 Hz |
| | Frequency inputs; with diagnistic capability; evaluation with integrated comparator<br>input frequency 1 $\qquad$ 100 Hz ... 50 kHz (IN 0)<br>input frequency 2 $\qquad$ 100 Hz ... 50 kHz (IN 1)<br>input resistance $\qquad$ 2,86 k$\Omega$ |
| Analog Inputs<br>(%IW6...%IW9)<br>can be configured as | Voltage inputs<br>input voltage $\qquad$ 0...10/32 V<br>resolution $\qquad$ 10 bit<br>input resistance $\qquad$ 50 k$\Omega$<br>input frequency $\qquad$ 50 Hz |
| | Current inputs<br>input current $\qquad$ 0/4...20 mA<br>resolution $\qquad$ 10 bit<br>input resistance $\qquad$ 400 k$\Omega$<br>input frequency $\qquad$ 50 Hz |
| Outputs<br>(%QX0.0 / 0.8 / 1.0 / 1.8)<br>can be configured as | Semi conductor outputs, positive switching (High Side), short-circuit an overload protected<br>switching voltage $\qquad$ 10...30 V DC<br>switching current $\qquad$ max. 4 A<br>total current $\qquad$ max. 16A |
| | PWM outputs; with diagnostic capability<br>PWM frequency $\qquad$ max. 250 Hz<br>PWM pulse ratio $\qquad$ 1...99 %<br>resolution $\qquad$ depending on the PWM frequency<br>switching current $\qquad$ max. 4 A<br>total current $\qquad$ max. 16 A<br>integrated pull-down resistor (4,7 k$\Omega$) to trigger Danfoss valves |
| | Current-controlled outputs; with diagnostic capability<br>switching current $\qquad$ 0,1...4 A<br>total current $\qquad$ max. 16 A<br>setting resolution $\qquad$ 1 mA<br>control resolution $\qquad$ 5 mA<br>accuracy $\qquad$ ± 2% FS |

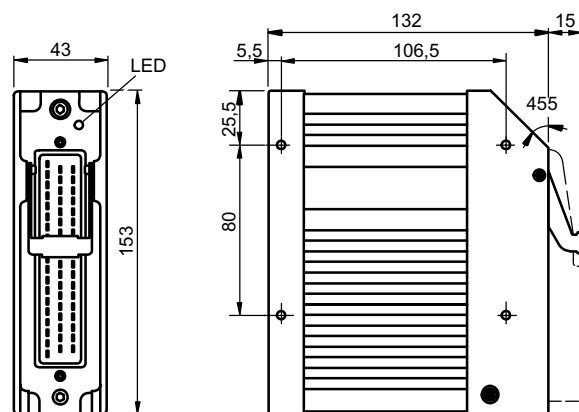| Characteristics | Description, value, unit |
|---|---|
| Input "TEST" | During thr test mode (e.g. programming) the "TEST" connection must be connected to $U_B$. For the "RUN" mode the input must not be connected.<br>input resistance      12 kΩ |
| Note | see also wiring |

## 2.3 Test standards and regulations

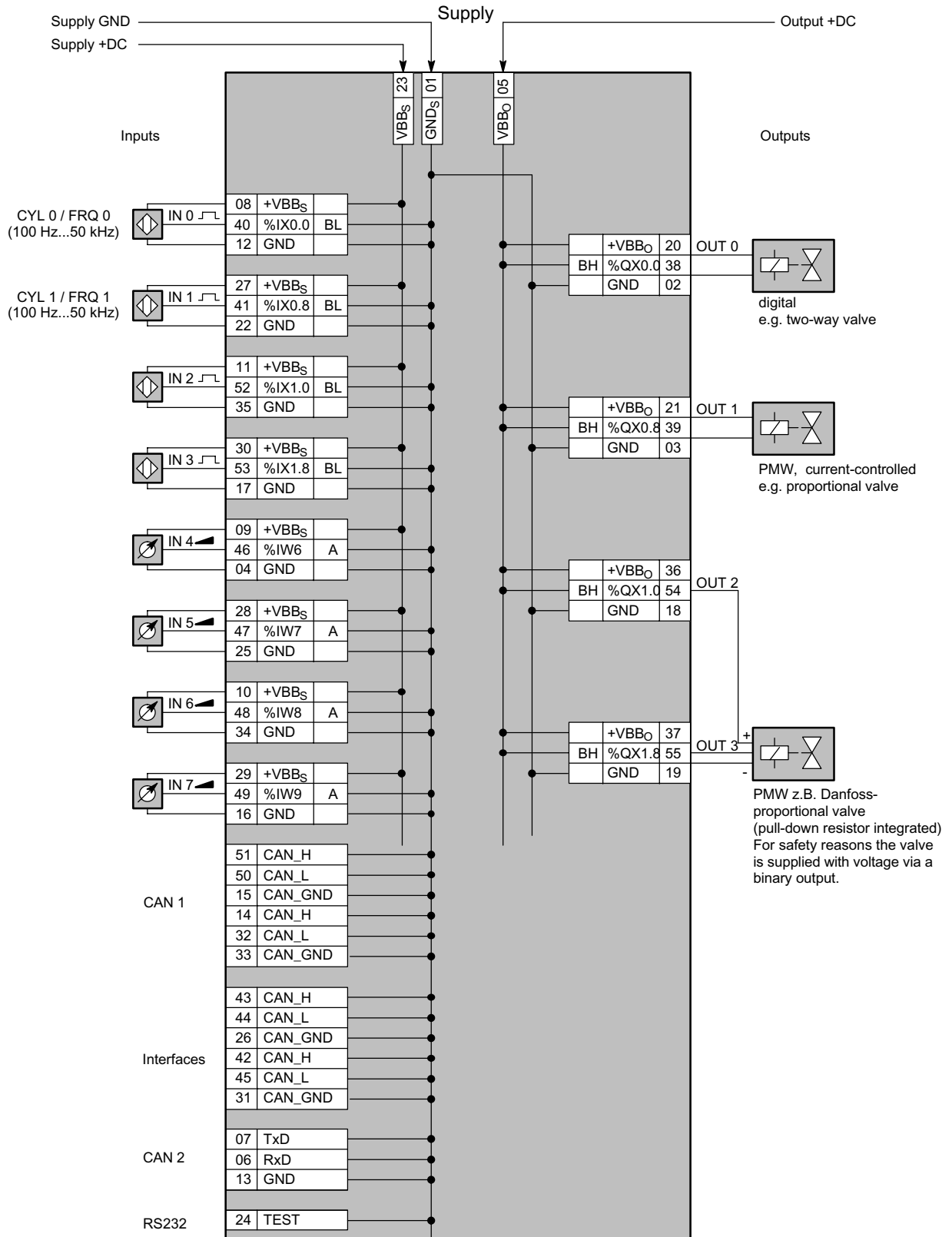| Characteristics | Description, value, unit |
|---|---|
| Humidity test to IEC 68-2-30 | ≤ 90% rel. humidity, non-condensing |
| Mechanical resistance | vibration to IEC 68-2-6<br>shock to IEC 68-2-27<br>bump to IEC 68-2-29 |
| Immunity to conducted interference | to DIN 40839 / part 1, pulses 1, 2, 3a, 3b (corresponds to ISO 7637)<br>severity level 4, function state A |
| | to DIN 40839 / part 1, pulses 5 (corresponds to ISO 7637)<br>severity level 1, function state C |
| | to DIN 40839 / part 3, pulses 1, 2, 3a, 3b (corresponds to ISO 7637)<br>severity level 4, function state A |
| Immunity to interfering fields | guideline 95/54/EG to EN 50082-2 (e1 type approval) |
| Interference emission | guideline 95/54/EG to EN 50081-1 (e1 type approval) |
| Railway specification | guideline BN 411 002 (DIN EN 50155, part 10.2) |

## 3    Ordering code

ELMR221 - 00***    without software
Order-no:            100026516

ELMR221 - 01***    with specific software
Order-no:            100......

## 4    Dimensions

# 5 Wiring

Supply

Supply GND

Supply +DC

Output +DC

Inputs

Outputs

| | VBB_S | 23 |
| | GND_S | 01 |
| | VBB_O | 05 |

CYL 0 / FRQ 0
(100 Hz...50 kHz)  IN 0

| 08 | +VBB_S | |
| 40 | %IX0.0 | BL |
| 12 | GND | |

CYL 1 / FRQ 1
(100 Hz...50 kHz)  IN 1

| 27 | +VBB_S | |
| 41 | %IX0.8 | BL |
| 22 | GND | |

IN 2

| 11 | +VBB_S | |
| 52 | %IX1.0 | BL |
| 35 | GND | |

IN 3

| 30 | +VBB_S | |
| 53 | %IX1.8 | BL |
| 17 | GND | |

IN 4

| 09 | +VBB_S | |
| 46 | %IW6 | A |
| 04 | GND | |

IN 5

| 28 | +VBB_S | |
| 47 | %IW7 | A |
| 25 | GND | |

IN 6

| 10 | +VBB_S | |
| 48 | %IW8 | A |
| 34 | GND | |

IN 7

| 29 | +VBB_S | |
| 49 | %IW9 | A |
| 16 | GND | |

| | +VBB_O | 20 | OUT 0 |
| BH | %QX0.0 | 38 | |
| | GND | 02 | |

digital
e.g. two-way valve

| | +VBB_O | 21 | OUT 1 |
| BH | %QX0.8 | 39 | |
| | GND | 03 | |

PMW, current-controlled
e.g. proportional valve

| | +VBB_O | 36 | OUT 2 |
| BH | %QX1.0 | 54 | |
| | GND | 18 | |

| | +VBB_O | 37 | OUT 3 |
| BH | %QX1.8 | 55 | |
| | GND | 19 | |

PMW z.B. Danfoss-
proportional valve
(pull-down resistor integrated)
For safety reasons the valve
is supplied with voltage via a
binary output.

CAN 1

| 51 | CAN_H |
| 50 | CAN_L |
| 15 | CAN_GND |
| 14 | CAN_H |
| 32 | CAN_L |
| 33 | CAN_GND |

Interfaces

| 43 | CAN_H |
| 44 | CAN_L |
| 26 | CAN_GND |
| 42 | CAN_H |
| 45 | CAN_L |
| 31 | CAN_GND |

CAN 2

| 07 | TxD |
| 06 | RxD |
| 13 | GND |

RS232

| 24 | TEST |

## Abkürzungen

| | | | | | |
|---|---|---|---|---|---|
| A | = | analog | FRQ | = | frequency inputs |
| BH | = | binary high side | PWM | = | pulse-width-modulated signals |
| BL | = | binary low side | RxD | = | serial interface (data received) |
| CAN_H | = | CAN-inerface | TxD | = | serial interface (data transmitted) |
| CAN_L | = | CAN-inerface | VBB_O | = | supply voltage outputs |
| CYL | = | inputs for time perid measurement | | | |

| VBB_S | = | supply voltage outputs/module |
| %IWx | = | IEC-address for analog input |
| %IX0.xx | = | IEC-address for binary input |
| %QX0.xx | = | IEC-address for binary output |