

MCR-f-UI-DC





Programmable Universal Frequency Transducer

1. Brief Description

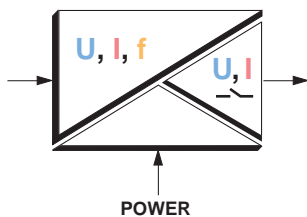
- Frequencies from 0.1 Hz...120 kHz
- Analog inputs selectable between 0-10 V or 0-20 mA
- Analog output and switching output
- 3-way isolation
- Programmable using membrane keypad
- Configuration via MCR/PI-CONF-WIN
- Display of the input or output signal

The new MCR-f-UI-DC is a frequency module that accepts frequencies between 0.1 Hz and 120 kHz. The input frequency can be easily selected within this range and is displayed on the front face of the module.

All common frequency signals (2, 3, and 4-wire) can be accepted on the input side. The input options are as follows

-  NAMUR sensors
-  Frequency generators
-  Dry contacts
-  Incremental encoder signals

The input pulses are evaluated by a period measurement, and the output is processed according to the lower measuring range value and the upper measuring range value into an analog voltage or current signal. The module features 3-way isolation between signal input, signal output, and supply to prevent any ground loop errors.



In addition to the analog output a transistor switching output, e.g. for alarm processing, is available. The input frequencies (lower and upper range) can be programmed in, using the membrane keypad, as revolutions per minute (rpm) or as Hz. Analog voltage and current inputs can also be converted and isolated. The LC display can show both input and output measurement values.

MCR-f-UI-DC Programmable Universal Frequency Transducer

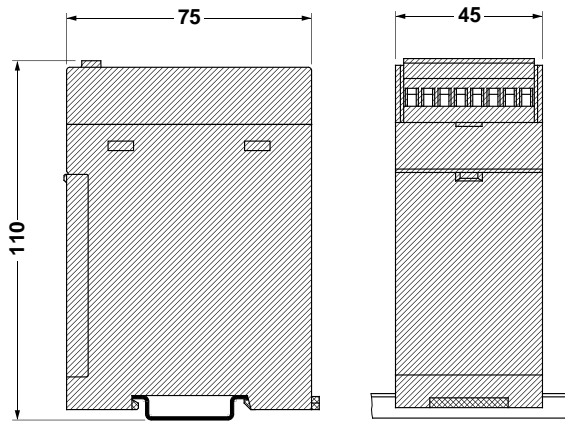


Fig. 3



Fig. 4

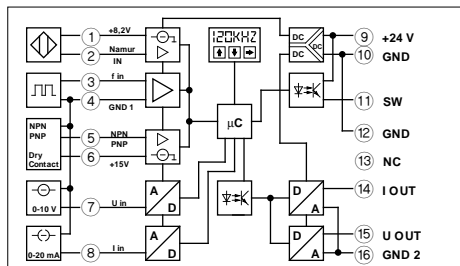


Fig. 5

MCR-f-UI-DC

with signal conversion: 0.1 Hz...120 kHz / 0...5 V; 0...10 V; 0...20 mA; 4...20 mA (also as inverse signals)

(UL, CE, RoHS) planned

Connection data	fixed	flexible	AWG
	[mm ²]		
Connection data	0.2-2.5	0.2-2.5	24-14

2. Description

MCR frequency transducer, for the conversion of frequencies into analog signals (also as inverse signals)

Output signal
 U_A/I_A

0...20 mA
4...20 mA
0...5 V, 0...10 V

Order No.

Pcs. pkt.

MCR-f-UI-DC

28 14 60 5

1

2.1. Technical Data

Input

Frequency input

Frequency range
Input sources

Sensor supply

Input frequency/ response time / resolution
Signal level

Input amplitude max.

Signal form
Puls length
Resolution
Signal conversion time

Current/voltage input (isolation amplifier functions)

Input signal
Input resistance
Resolution
Step -response(10-90 %)

Output

Output signal
Max. output signal: current/voltage
Load: current/voltage
Zero and span adjustment
Ripple
Switching output

0.1 Hz...120 kHz

- NPN/PNP transistor outputs
- NAMUR sensor
- Electrically isolated relay contact (dry contact)
- Frequency generator

Approx. 15 V DC (25 mA constant maximum)

0.1 Hz...120 kHz / ≤ 32 ms / ≥ 12 bits

1 V (typical 0,5 V) square-wave voltage 0,1 Hz...120 kHz

1 V (typical 0,5 V) sinusoidal voltage 1,0 Hz...120 kHz

5 V (typical 1,0 V) sinusoidal voltage 0,1 Hz...120 kHz

max. 30 V (incl. direct voltage)

Any

≥ 1 μ s

≥ 12 BIT

≤ 32 ms

0...10 V / 0...20 mA (can be selected)

95 k Ω /200 Ω

14 Bit (Full Scale)

< 25 ms

0...10 V/10...0 V, 0...5 V/5...0 V or 0(4)...20 mA/20...0(4) mA

25 mA / 12.5 V

≤ 500 Ω / ≥ 500 Ω

± 25 %

< 20 mV_{ss}

PNP transistor output switches the supply voltage at Terminal SW with a load capacity of 100 mA

2.2. General Data

Supply voltage		20...30 V DC
Current consumption (without load)		< 60 mA (without switching output)
Transmission error		< 0.15 % of the measured value (0.1%, typical)
Temperature coefficient		< 0.01 %/K (0.007%/K, typical)
Test voltage:	Input/supply	1.5 kV, 50 Hz, 1 min.
	Input/output	1.5 kV, 50 Hz, 1 min.
	Output/supply	1.5 kV, 50 Hz, 1 min.
Protective circuit		transient protection, polarity protection
Ambient temperature range		-20°C to + 65°C [-4°F to +149°F] (for specified data)
Operating indicators		LCD
Operator's panel		Membrane keypad with 3 keys and LCD window
Connection method/mounting position/mounting		Plug-in screw terminal blocks
Dimensions (W x H x D)		Any, horizontal preferred
Housing material		45 mm x 75 mm x 110 mm (1.772 in. x 2.953 in. x 4.33 in.) ABS

2.3. EMC Electromagnetic Compatibility



Conforms to the EMC directive 89/336/EEC and the low voltage directive 73/23/EEC

Noise immunity according to 50082-2

• Electrostatic discharge (ESD)	EN 61000-4-2	Criterion B 8 kV air discharge 6 kV contact discharge
• Electromagnetic HF field:	EN 61000-4-3	Criterion A 10 V/m
• Fast transients (burst)	EN 61000-4-4	Criterion B I/O/S: 2 kV/5 kHz ¹⁾
• Surge current load (surge)	EN 61000-4-5	Criterion B I/O: 2 kV/42 Ω ¹⁾ S: 1 kV/ 2 Ω ¹⁾
• Conducted interference	EN 61000-4-6	Criterion A I/O/S: 10 V ¹⁾
• Noise emission according to EN50081-2	EN 55011	Class A

EN 61000 corresponds to IEC 1000
EN 55011 corresponds to CISPR11

¹⁾ I = input/O = output/S = supply

Criterion A: normal operating characteristics within the specified limits.
Criterion B: temporary interference with the operating characteristics which the device corrects itself.

Class A: industrial application, without special installation measures.

2.4. Function Elements

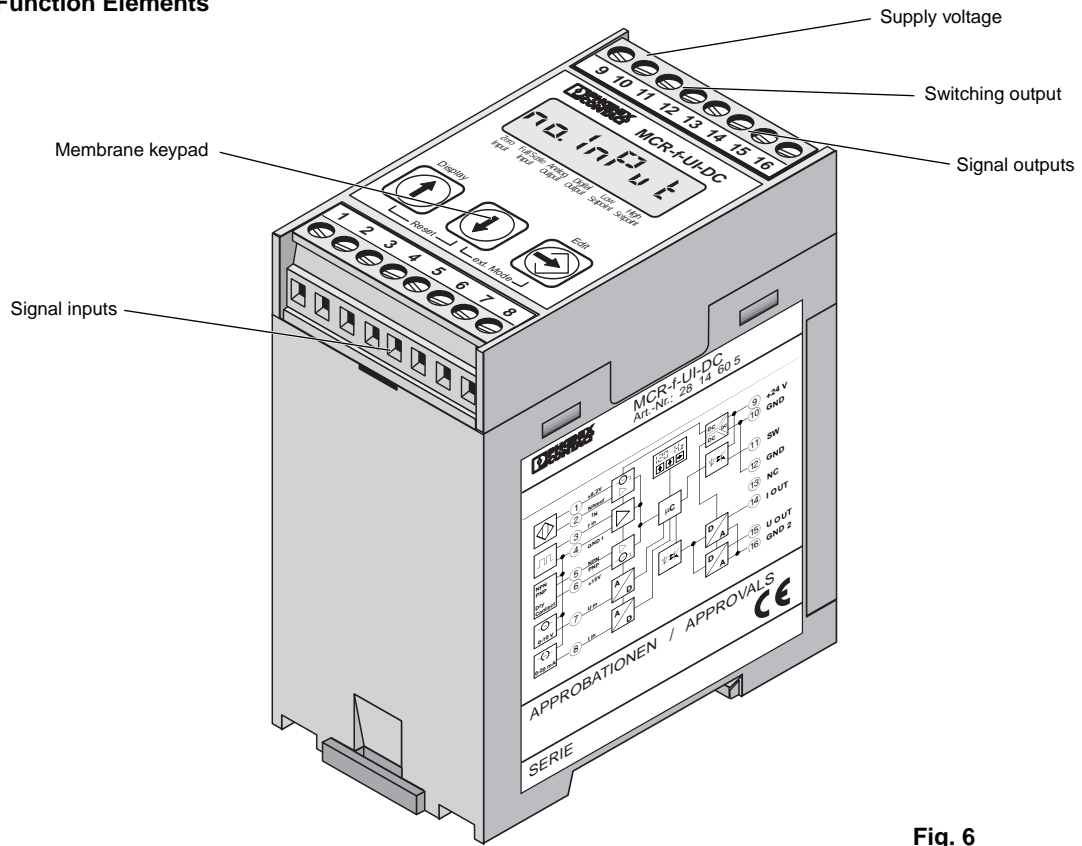


Fig. 6

3. Connection and Operating Instructions

3.1. Connection Method

2-wire DC (dry contact)

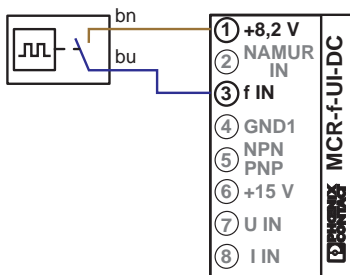


Fig. 7

2-wire DC NAMUR sensor

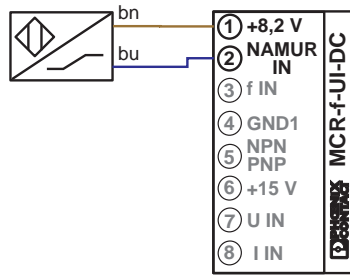


Fig. 8

U input (DC voltage)

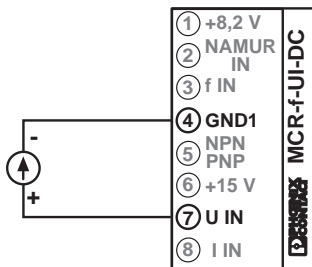


Fig. 9

I input (DC current)

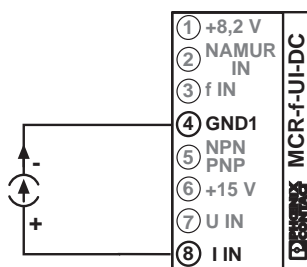


Fig. 10

3.1. Connection Method (continued).

3-wire DC (DC voltage) with:
PNP transistor output

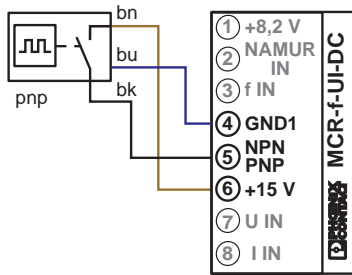


Fig. 11

NPN transistor output

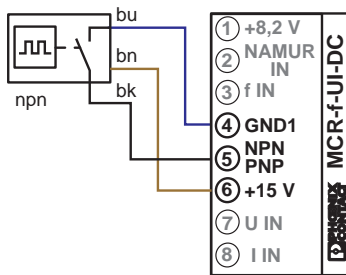


Fig. 12

4-wire DC (DC voltage) with:
PNP transistor output

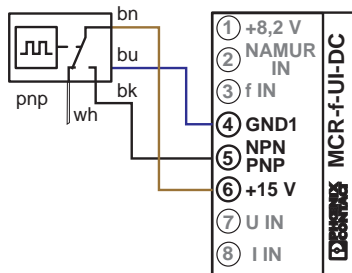


Fig. 13

NPN transistor output

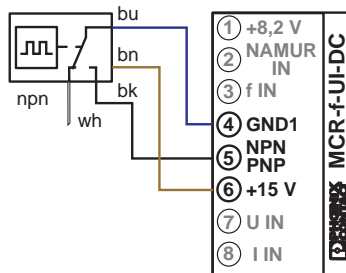


Fig. 14

Incremental rotary transducer with push-pull:
Separate power supply

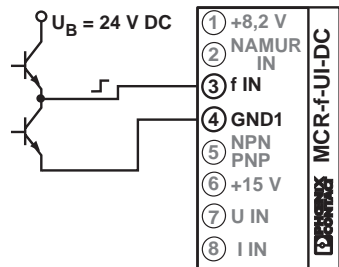


Fig. 15

Power supply provided by the module

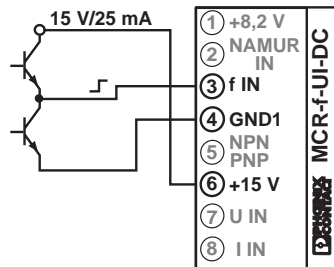


Fig. 16

Incremental rotary transducer with HTL logic:
Separate power supply

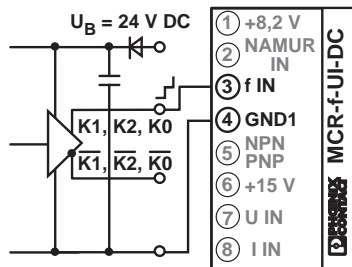


Fig. 17

Power supply provided by the module

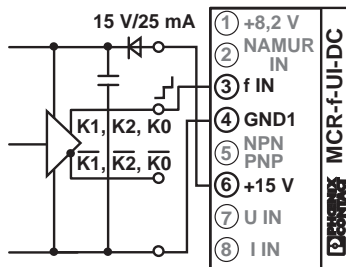
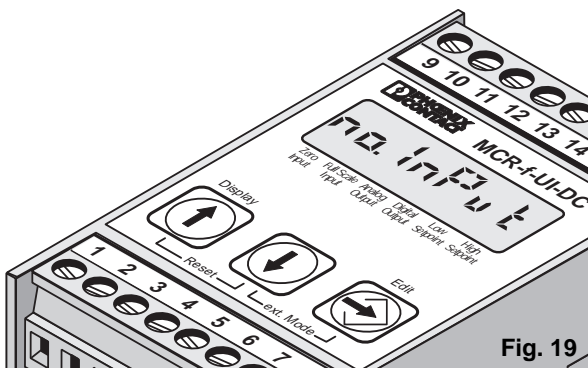


Fig. 18

3.2. Functions of the Membrane Keypad



- Press and release button: The calculated output value is displayed. By pressing the button again you return to the existing input measurement value.
- Press and release button (< 0.5 sec.): The module switches to edit mode for frequency input signals
- Press button for min. 2 seconds: The module switches to edit mode for analog input signals
- Press and release buttons together (< 0.5 sec.): The module switches to extended edit mode
- Press and release buttons together: Close edit mode without saving any changed settings
- The existing setting is accepted in edit mode and changes automatically to the next value.


Special functions of the keypad in edit mode


- In edit mode for pulse input signals and for analog input signals, pressing the enter button in addition to the or button accelerates the downward or upward input selection. A fine adjustment is possible by releasing the button and pressing it lightly again.

3.3. LC Display

3.3.1. Display within Setting Range

- Frequency input for NAMUR, 2-, 3- and 4-wire sensors, incremental rotary transducer with push-pull and HTL output signal and dry contact. The setting is optional in Hz or revolutions per minute (rpm).
- Frequency input for NAMUR sensors with open circuit and short circuit recognition. The setting is optional in Hz or rpm.
- Current input 0...20 mA (selectable)
- Voltage input 0...10 V (selectable)
- On delay time of the switching output (setting range 0...30 sec., default value = 0.00 sec.).
- Off delay time of the switching output (setting range 0...30 sec., default value = 0.00 sec.).
- Sets the POWER ON delay time (switching output)(setting range 0...30 sec., default value = 1.00 sec.). The switching output does not respond to events during this time. This function is only effective directly after switching on the supply voltage.
- Sets the open circuit recognition time (setting range 0.1...10.1 sec., default value = 10.1 sec.). No input signal is recognized during this time, therefore "no input" appears in the display and the outputs respond according to their settings.
- Sets the end value (setting range 75...125 %, default value = 100 %) with reference to 10 V or 20 mA.
- Sets the zero point depending on the chosen output signal: (setting range -5...+5 mA / -2.5...+2.5 V; default value = 0 mA / 0 V)
- Sets the division factor from 0.1 to 9999 (default value = 1.0). Slow positioning tasks require multiple subdivided holed coupling halves (factor > 1). Speed measurement of a motor at the gears requires a small division factor (factor < 1).
- Save. The set parameters are saved by pressing the button.

EXIT The setting mode is interrupted, without saving the set parameters, by pressing the  button.

DEFAULT The existing settings are overwritten by the default values by pressing the  button. The parameters of the frequency input and the analog input remain unaffected.

3.3.2. Displaying the Switching Output

..0.. When the "High Setpoint" is exceeded the transistor switches to "High" and when the value falls below the "Low Setpoint" it switches to "Low" (with hysteresis).

..0.. When the "High Setpoint" is exceeded the transistor switches to "Low" and when the value falls below the "Low Setpoint" it switches to "High" (with hysteresis).

..1.. When the value falls below the "High Setpoint" the transistor switches to "High".

..1.. When the "High Setpoint" is exceeded the transistor switches to "High".

ON Transistor is permanently on.

OFF Transistor is permanently off.

..n.. Transistor switches between "Low Setpoint" and "High Setpoint" to "High".

..U.. When the value falls below the "Low Setpoint" and when the "High Setpoint" is exceeded the transistor switches to "High".

3.3.3. Messages in the Operating State

---LnR Falling below measuring range
This message flashes alternatively with the existing frequency if the value falls below the lower measuring range.

---OvR Exceeding the measuring range.
This message flashes alternatively with the existing frequency if the upper measuring range is exceeded.

no.inP u t No input signal.
This message flashes for the following reasons:
1. No sensor connected
2. For NAMUR: short circuit or open circuit
3. Short circuit frequency ↔ GND
4. No input signal detected within the set open circuit recognition time (l.br.time)

3.3.4. Menu-Driven Operation

In edit mode, an arrow points to each function to be set.

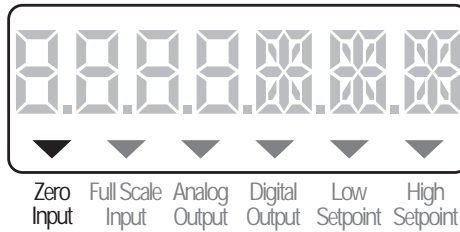
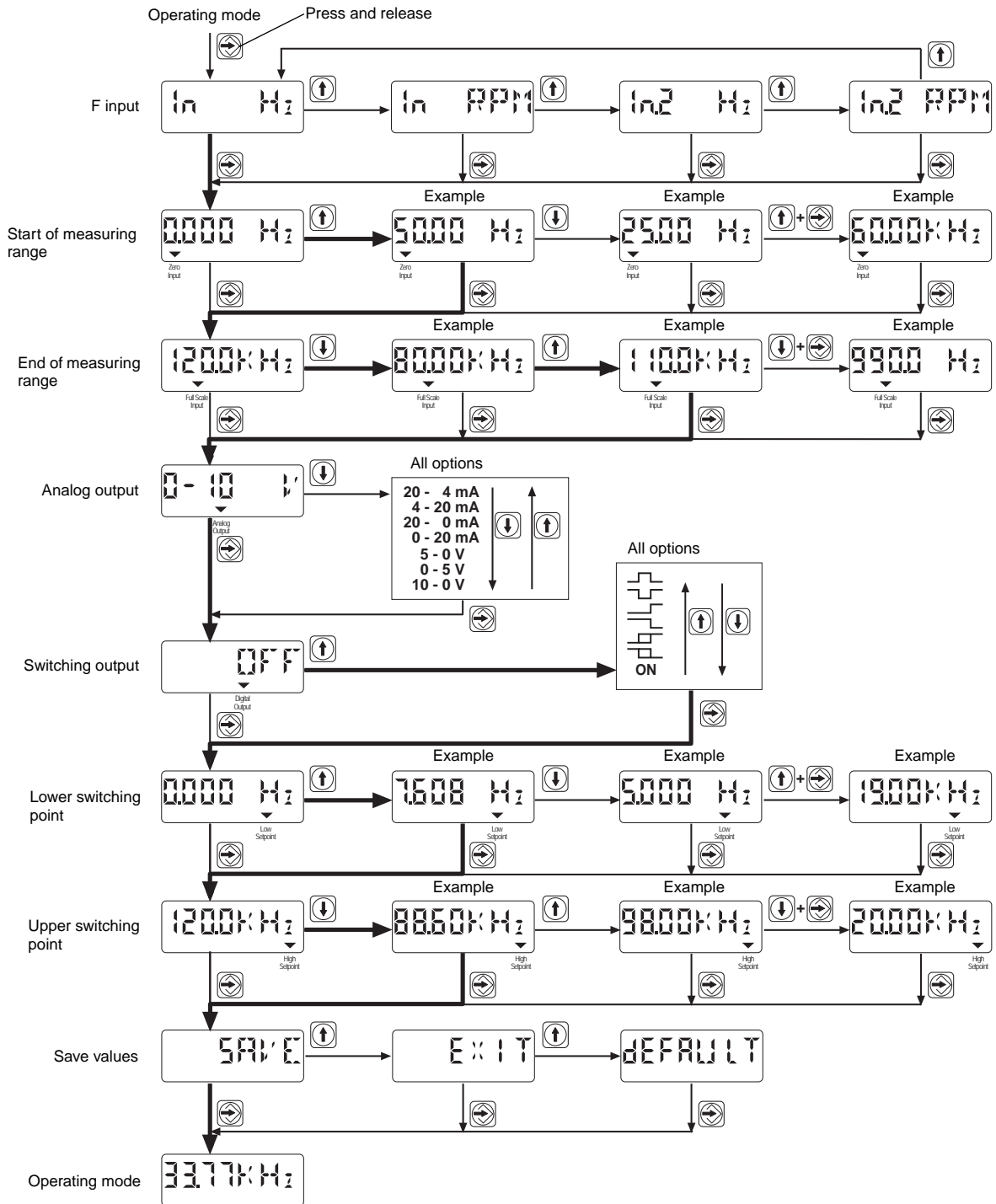


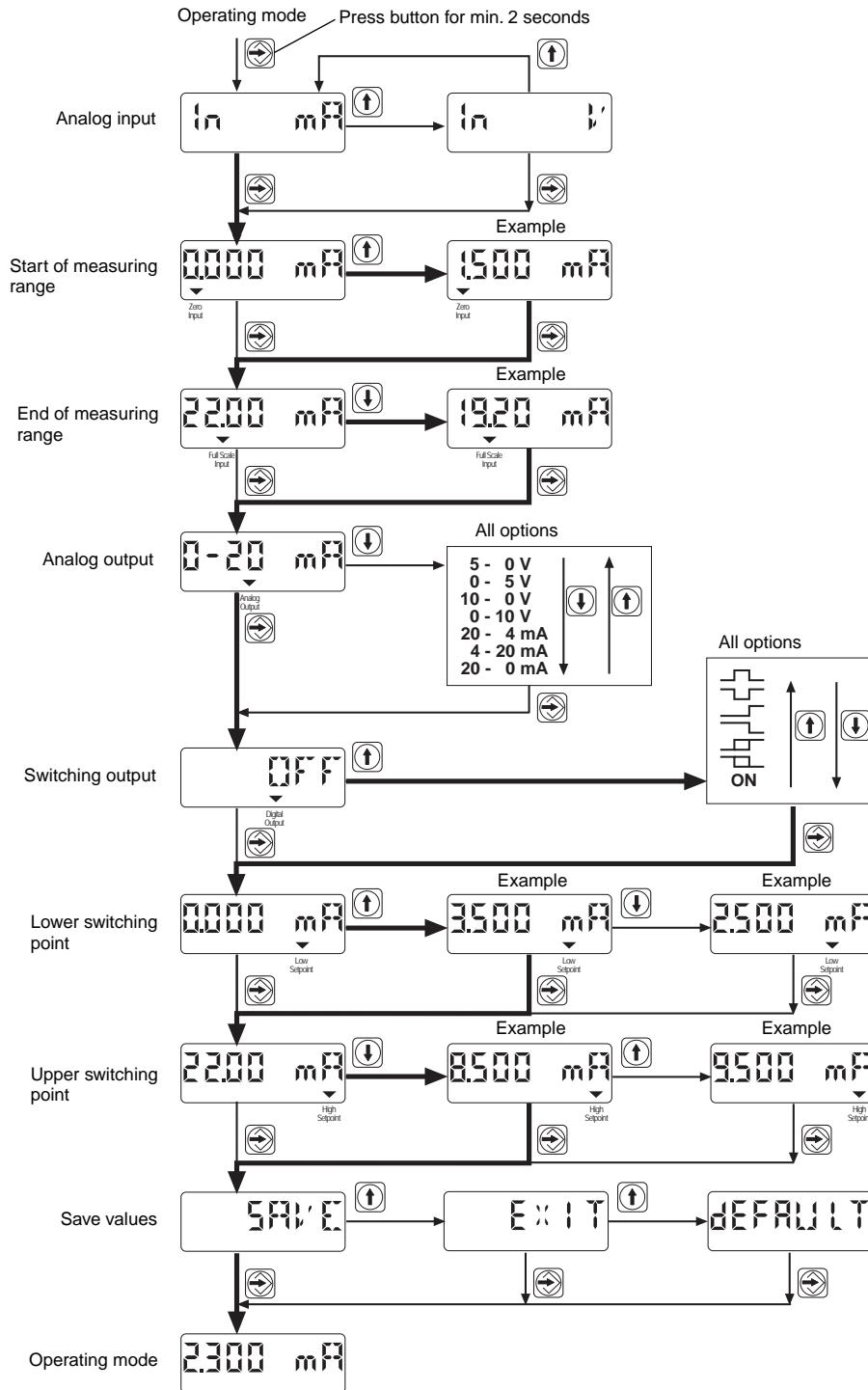
Fig. 20

3.4. Menu Flow Diagram

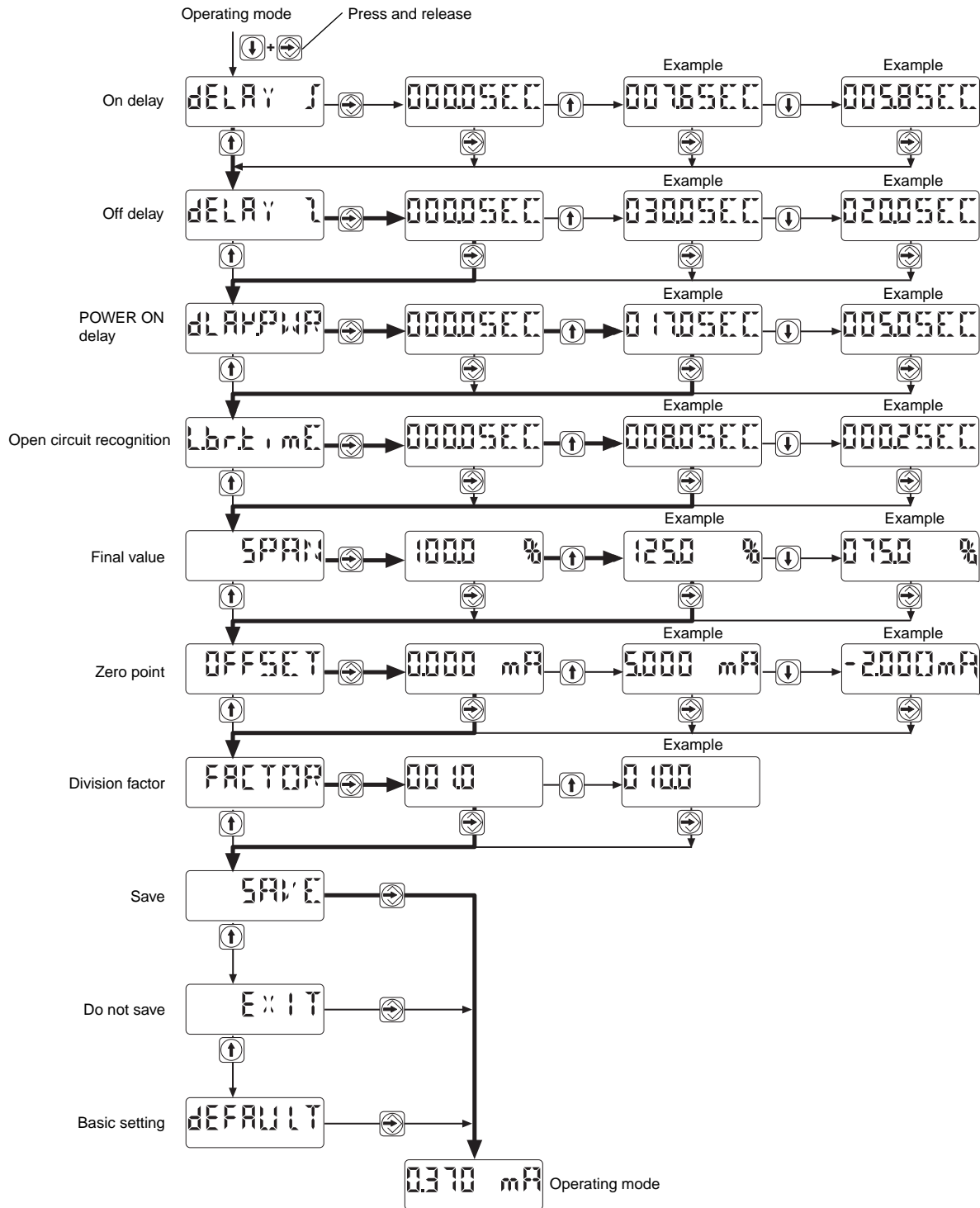
3.4.1. Configuration of the Frequency Input - Menu Sequence



3.4.2. Configuration of Analog Input – Menu Sequence



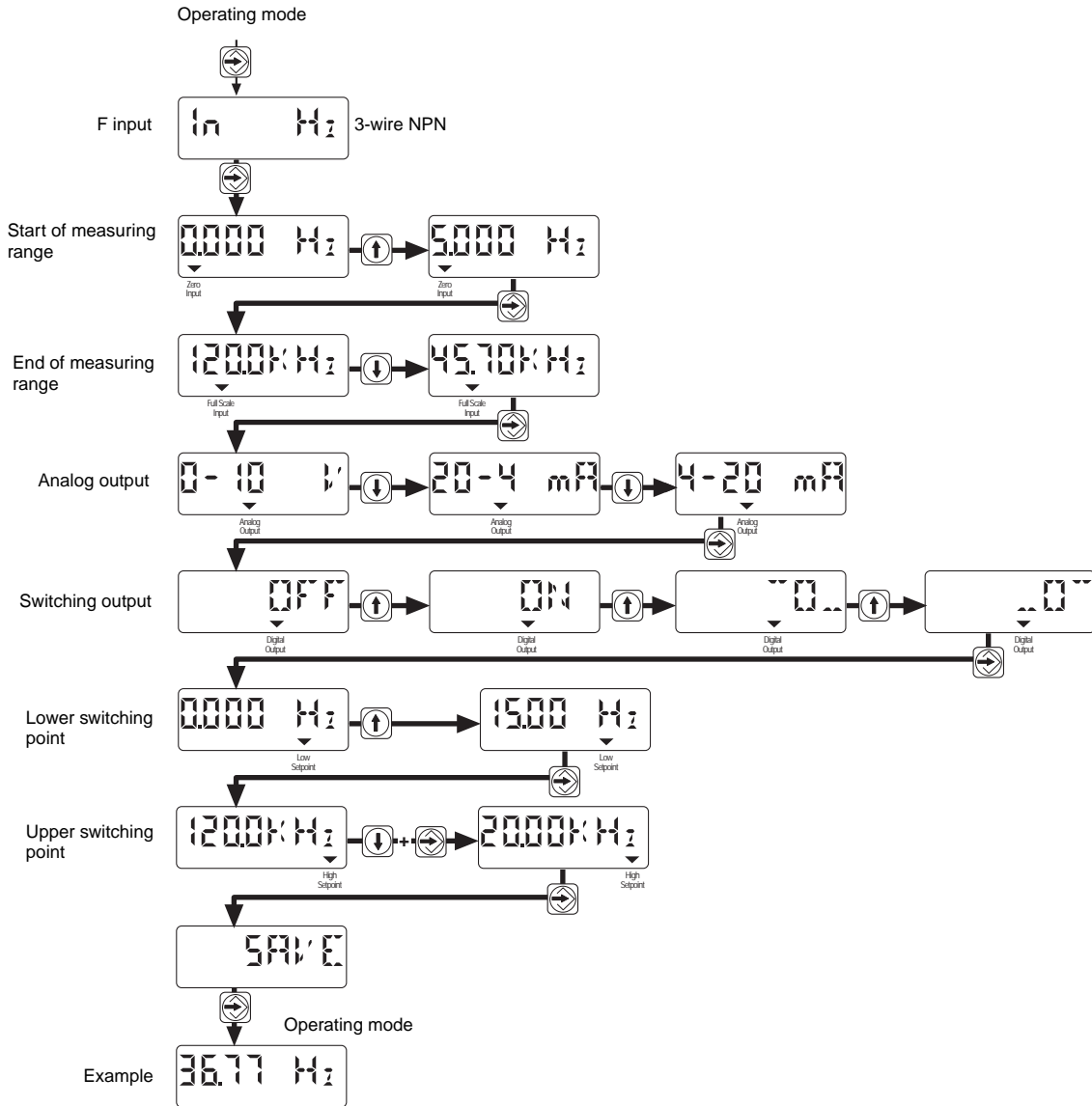
3.4.3. Configuration of the Extended Operating Mode – Menu Sequence



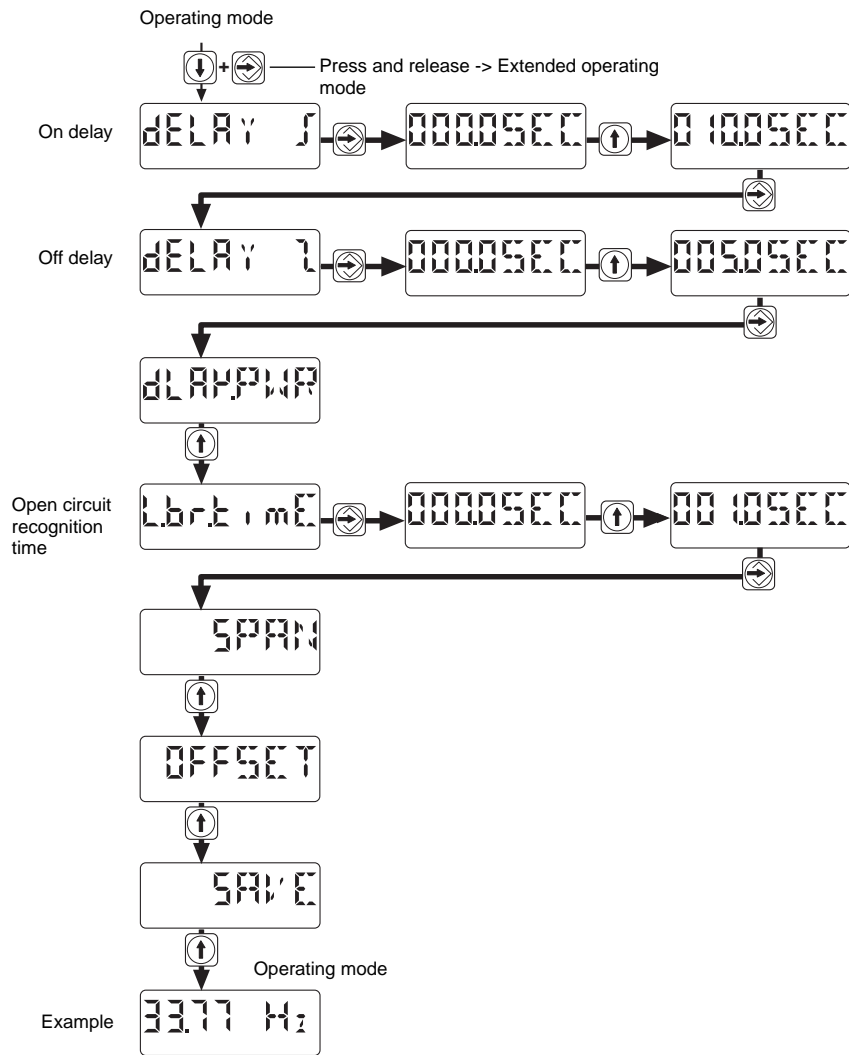
3.4.4. Example: Configuration with a Frequency Input Signal

Setting the MCR-f-UI-DC module for the following parameters:

- Frequency range: 5...45700 Hz,
- 3-wire NPN sensor
- Output signal: 4...20 mA
- Switching behavior: Lower switching point ("High" to "Low") at 15 Hz
- On delay: 10 s
- Open circuit recognition time: 1 s



Configuration Example (continued):



3.5. Configuration

Configuration Software MCR/PI-CONF-WIN-... for Frequency Transducer MCR-f-UI-DC

The MCR configuration software will be available at the end of 1999 for the configuration and visualization of all parameters for the MCR-f-UI-DC frequency transducer.

The MCR software runs under Windows 3.1x, Windows 95®, Windows 98® and under Windows NT.

The modules are configured via a serial interface. A label is also created by the software that can be placed on the module.



Fig. 21

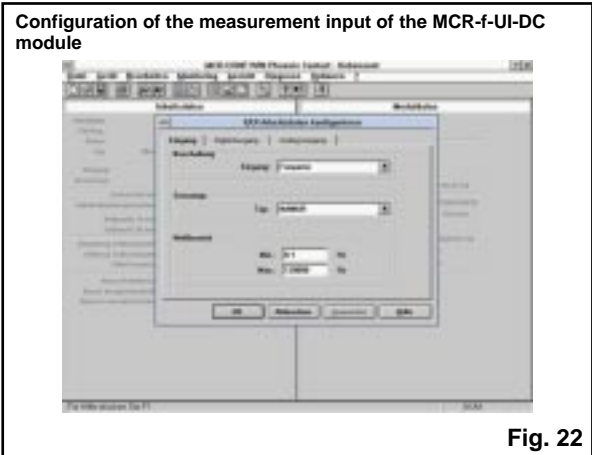


Fig. 22

3.6. Application Example: Speed Measurement of a Drive

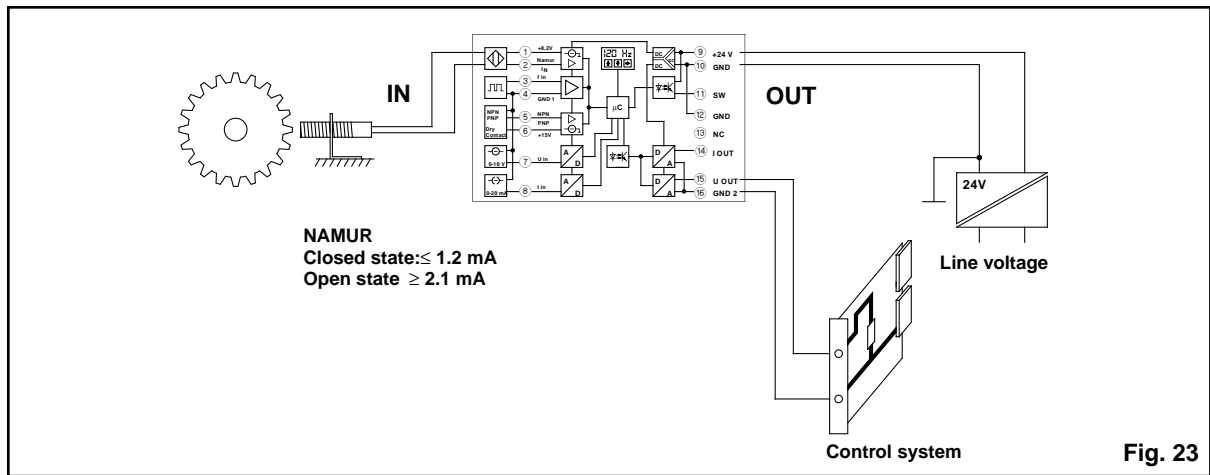


Fig. 23