DCBA1ME, DCBA2ME

General

The DCBA1ME and the DCBA2ME amplify the voltage differences of full resistor bridges.

Figure 1: DC Bridge Amplifier DCBA1ME.

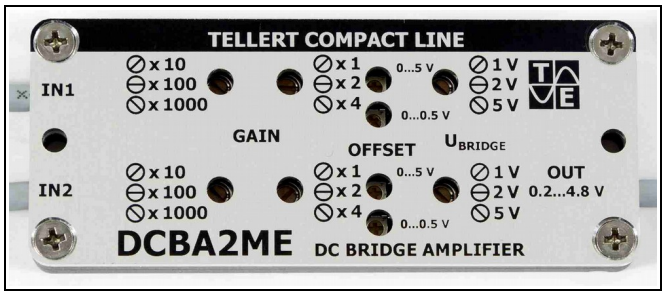
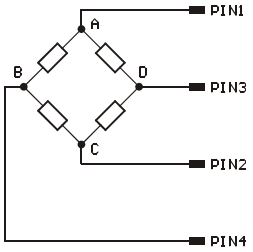


Figure 2: DC Bridge Amplifier DCBA2ME.

The DCBA1ME supports one bridge whereas the DCBA2ME supports two bridges.



Usually, point A of the bridge above is connected with the bridge supply (1 V DC, 2 V DC, or 5 V DC) and point C is connected with ground (0 V). Then, one of the points B and D is connected with the inverting sensor input, and the other point is connected with the noninverting sensor input. Using this configuration, the signal to be amplified is given by the voltage difference between noninverting and inverting sensor input.

Voltage Amplifier

Another application is to use the DCBA1ME or DCBA2ME without the resistor bridge as a voltage amplifier for positive voltage signals within the range from 0 V to 400 mV. Note that pin 2 of the corresponding input socket must be short-circuited to pin 3.

IN1/IN2: This socket is manufactured by Binder (Binder Series 719). The socket IN1 refers to channel CH1, and the socket IN2 refers to channel CH2 and is only available for DCBA2ME.

Pin	Assignment for voltage amplifier [Wire color]
1	Unconnected [white]
2	Ground (short-circuit to pin 3 is required) [brown]
3	Ground (short-circuit to pin 2 is required) [green]
4	Positive voltage signal (0...400 mV) [yellow]

Output Signal

The output voltage U_o is defined as

$$U_o(r) = a \cdot U_r \cdot r + U_z$$

$$r = \frac{U_n - U_i}{U_r}$$

where

a is the amplification,
r is the auxiliary ratio,
U_r is the voltage between point A and point C,
U_z is the amplifier's offset voltage,
U_n is the noninverting input voltage,
U_i is the inverting input voltage.

For force sensor applications, the output voltage U_o is defined as

$$U_o(F) = \frac{a \cdot U_r \cdot r_{max}}{F_{max}} \cdot F + U_z$$

where

a is the amplification,
F is the force,
r_{max} is the auxiliary ratio at F_{max} (e.g. 2 mV/V)
F_{max} is the force at r_{max} (e.g. 500 N)
U_r is the voltage between point A and point C,
U_z is the amplifier's offset voltage.

For voltage amplifier applications, the output voltage U_o is defined as

$$U_o(U) = a \cdot U + U_z$$

where

a is the amplification,
U is the positive voltage signal,
U_z is the amplifier's offset voltage (usually 0.5 V)

The amplifier's output voltage lies within the range from 0.2 V to 4.8 V.

Copyright © 2014 Rudy Tellert Elektronik

Setup

The amplification *a* is set with the two GAIN switches:

Gain switch 1	Gain switch 2	Amplification *a*
x10	x1	10
x10	x2	20
x10	x4	40
x100	x1	100
x100	x2	200
x100	x4	400
x1000	x1	1000
x1000	x2	2000
x1000	x4	4000

The offset voltage U_z is set with the two OFFSET potentiometers: One coarse potentiometer (0...5 V) and one fine potentiometer (0...0.5 V).
Unipolar applications usually use U_z = 0.5 V, and bipolar applications usually use U_z = 2.5 V.

The bridge supply is set with the U_{BRIDGE} switch to 1 V DC, 2 V DC or 5 V DC.

TEMES Parameters (General)

The parameters which are used by TEMES to define a linear relationship between physical value *p* and input signal *v* are not (as commonly used) polynomial coefficients. Instead, TEMES uses two distinct points $P_0 = (v_0, p_0)$ and $P_1 = (v_1, p_1)$ of a two dimensional space, which is spanned by the input signal and the physical value. The relationship is then given by the line through these two points. The coordinates of the two points are given by the first physical value p_0, the corresponding input signal v_0, the second physical value p_1 and the corresponding input signal v_1. Note that p_1 must not equal p_0 and v_1 must not equal v_0.

Factor *m* and offset *t* are used to describe the linear relationship with polynomial coefficients. Thus, $p(v) = m \cdot v + t$.

Factor, Offset	Example for two points
$m = \frac{p_1 - p_0}{v_1 - v_0}$ $t = p_0 - m \cdot v_0$	P_0: $v_0 = 0$, $p_0 = t$ P_1: $v_1 = 1$, $p_1 = m + t$

TEMES Parameters (DCBA)

The following TEMES parameters may be used for a force sensor application:

Point P_0:	p_0 = 0 N	$v_0 = U_z$
Point P_1:	$p_1 = F_{max}$	$v_1 = a \cdot r_{max} \cdot U_r + U_z$

Pin Assignment

The plugs and sockets of the DCBA1ME/DCBA2ME are compatible with DCBA2/DCBA8.

IN1/IN2: This socket is manufactured by Binder (Binder Series 719). The socket IN1 refers to channel CH1, and the socket IN2 refers to channel CH2 and is only available for DCBA2ME.

Pin	Assignment [Wire color]
1	Bridge supply U_{BRIDGE} (1 V DC, 2 V DC, or 5 V DC; max 25 mA) [white]
2	Bridge ground (0 V) [brown]
3	Inverting input [green]
4	Noninverting input [yellow]

Note that the valid CMMR (common-mode input voltage range) is from -0.1 V to 3.4 V (Both, inverting and noninverting input voltages must be within this range).

OUT: This plug is manufactured by Binder (Binder Series 719). It supplies the DCBA with voltage and puts out the amplified signals.

Pin	Assignment [Wire color]
1	Supplying voltage (7 V DC to 16 V DC) [white]
2	Ground [brown]
3	Output channel CH1 [green]
4	[DCBA2ME only:] Output channel CH2 [yellow]

Electrical Specifications

Input signal frequency range (typical):
$f_{-0.1\ dB}$ >1 kHz; $f_{-3\ dB}$ > 4 kHz;

Gain Error (verified): e_g < 1.5 %

Max Input Offset Drift (typical): 2 µV/°C

Noise (typical): $35 \frac{nV}{\sqrt{Hz}}$ RTI noise at 1 kHz

Current consumption without bridge (pin 1 of IN1/IN2 is unconnected): about 2 mA per channel

Mechanical Specifications

Box Dimensions:	DCBA1ME: 72 mm x 17 mm x 8 mm DCBA2ME: 72 mm x 30 mm x 8 mm
Weight:	DCBA1ME: 27 g DCBA2ME: 41 g
Cable IN1/IN2:	Length: about 5 cm
Cable OUT:	Length: about 46 cm
Box Protection:	Splash-proof
Switches:	Slot width: 1.8 mm

The boxes are stackable with M3 screws.

Copyright © 2014 Rudy Tellert Elektronik