a-eberle

Position Indicator Interface
Typ REG-FR 'B1'

The REG-FR resistance interface converts the position of a tap changer with resistor row into a BCD code for RegSys system. A build-in power supply supports the measure transducer, voltage outputs and relays.

Tap changer resistors (same values) will be connected to the measure input of REG-FR by only 3 or 4 wires. The resistor step value (Rs) of one of these resistors should be adjusted by potentiometer R and will be displayed by a voltage measurement on both front connectors (range DC 5V,Rin >500 kΩ/V), with 0.1V/Ω at feature **'R1'**; 0.5V/Ω at **'R2'**; 1V/100 Ω at **'R3;** 0.5V/100 Ω at **'R4'**; 0.5V/10 Ω at feature **'R5'** on display.

6 relay contacts (NO contacts) and 6 current outputs make the BCD code available for further use.

- Up to 37 uniform resistor tap-change positions are converted into a BCD code
- 3- or 4-wire connection is applicable
- Up to 100 m distance between tap changer and REG-FR
- Contacts with AC 250V 2A, DC 220V 150W
- Large auxiliary voltage range of the power supply

Technical specifications

Regulations and standards
IEC1010, IEC801-1 to 6, VDE0110, VDE0160
Interference immunity   EN50082-2
Emitted interference   EN50081-2, EN55011

Mechanical data
|	
Design	19"plug-in modules (8TE, 3HE)
Circuit board	100 x 160 mm
Front panel	Aluminum, RAL 7035 grey
Configurations	according to DIN 41494 part 5
Plug-in connector	2 units. 'F1': DIN 41612 MH 24+7pole
	'F2': DIN 41612 F 48-pole
19"mounting	'F1' at position 'n' and 'F2' plus 5 TE
Degree of protection	IP00
Weight	Plug-in modules ≤ 0.3 kg

Input
Row resistor Rs	1.5 .. 10 Ω each Step (feature R2)
	5 .. 50 Ω each Step (feature R1)
	30 ..100 Ω each Step (feature R5)
	100 .. 500 Ω each Step (feature R3)
	200 .. 1000 Ω each Step (feature R4)

Number of tap changer resistors   < 38
Resistor tolerance Rs   <2 % from adjusted value wire
3-/ 4-wire connection compensates wire resistance R_L
Wire resistance R_L < 20 Ω
Measure current IK   0.1..10 mA through resistor row
AC voltage on input   <0.3 V 50 Hz

Output
Binary output BCD 1 … BCD 20/sign- to the BCD input (50V) of the REG-D; reference BCD GND
Voltage at 10kOhm   ON (1) ≥10 V DC
       OFF (0) ≤ 5 V DC
Voltage output U+   15 V DC ± 10 %; reference GND;
     Internal resistance 1 kΩ

Relays with one N/O contact for output:
BCD Codes 1..20/sign- contact closed (1) / open (0)
Potential isolation   auxiliary voltage and relays contacts from each other and all other circuits
Contact load   AC 250 V 2 A, DC 220 V 150 W

Number of switching operations $< 10^5$
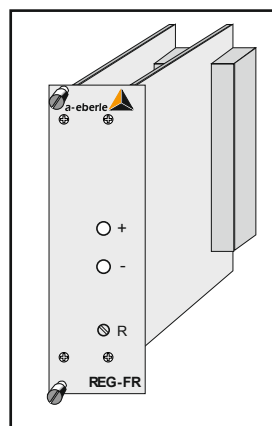
Code table
Res.-Step Input:	Dez	Output signal BCD-Code					
		20	10	8	4	2	1
0 Ohm	1	0	0	0	0	0	1
1 x Rs	2	0	0	0	0	1	0
2 x Rs	3	0	0	0	0	1	1
8 x Rs	9	0	0	1	0	0	1
…							
9 x Rs	10	0	1	0	0	0	0
28 x Rs	29	1	0	1	0	0	1
…							
29 x Rs	30	1	1	0	0	0	0
30 x Rs	31	1	1	0	0	0	1
broken wire	**39**	1	1	1	0	0	1

Transfer behavior
By default the REG-FR is set to 3-wire connection and the tap-changer resistor to 10 Ω/step at feature R1 (3.0 Ω/step at feature R2; 100 Ω/step at feature R3; 200 Ω/step at feature R4; 30 Ω/step at feature R5) adjusted. If a different adjustment value is required, please specify when ordering.

Cutting the wire on PC board and the wire between connector F2/2d and F2/4d activates the 4 wire resistance compensation. No measure current flows thru the tap switch and short disconnections will be suppressed.

Safety
Safety class / overvoltage category	I/II
Contamination level	2
Test voltage	AC 2.3 kV
Measurement input, BCD-output	to auxiliary voltage
	to relay contacts
Auxiliary voltage	to relay contacts

Power supply
Galvanically   Feature H1 AC 100 … 240 V / DC 100 … 353V
isolated   Feature H2 AC 20 … 60 V / DC 20 ... 72V
Power consumption   < 6 VA / 6 W H1; 1 A/T H2; 2 A/T

Temperature   Operation   0 ... +65 °C
           Storage, transport   -25 ... +85 °C

Contact assignment
connector **'F1'** "MH" 24+7p.	z	b	d
2	relay BCD 1		relay BCD 1
4	relay BCD 2		relay BCD 2
8	relay BCD 4		relay BCD 4
10	relay BCD 8		relay BCD 8
14	relay BCD10		relay BCD10
16	relay BCD20 od. sgn-		relay BCD20 od. sgn-
28	power supply AC/DC L / +		
30	power supply AC/DC N / -		
32	PE		

connector **'F2'** "F" 48pol.	z	b	d
2			IK
4			Rsi
6			Rsg
8			GND R
10			
20	U+	U+	U+
26	GND	GND	GND
28	BCD 1		BCD 2
30	BCD 4		BCD 8
32	BCD 10		BCD 20 od. sgn-

Features		Code		
Position indicator interface REG-FR 19"plug-in module 8TE 3HE		**REG-FR B1**		
Auxiliary voltage	AC 100..240 V / DC 100…353 V	**H1**	Transfer behavior	Sample calculation
galvanically isolated	AC 20... 60 V / DC 20 ... 72 V	**H2**		
Row resistor Rs	Rs / step 1.5 ... 10 Ω	**R2**	0.5V / Ω	3.0 R*0.5=1.5 V
	Rs / step 5 ... 50 Ω	**R1**	0.1V / Ω	24 R*0.1=2.4 V
	Rs / step 30 ... 100 Ω	**R5**	0.5V / 10 Ω	83 R*0.5/10=4.15 V
	Rs / step 100 ... 500 Ω	**R3**	1.0V / 100 Ω	300 R*1/100=3.0 V
	Rs / step 200 ... 1000 Ω	**R4**	0.5V / 100 Ω	500 R*0.5/100=2.50V
Deviating code table (max. 6 outputs) 4-wire compensation		**Y99**	Specify deviating code table when ordering: Example: -9 ... -0 …19	

The interface is also available in a wall-mounting housing (feature B2) or panel mount case with display (feature B3). Further, interfaces with standard signal input 0/4...20 mA or output codes such as BINARY, AWZ or GRAY-code are available.
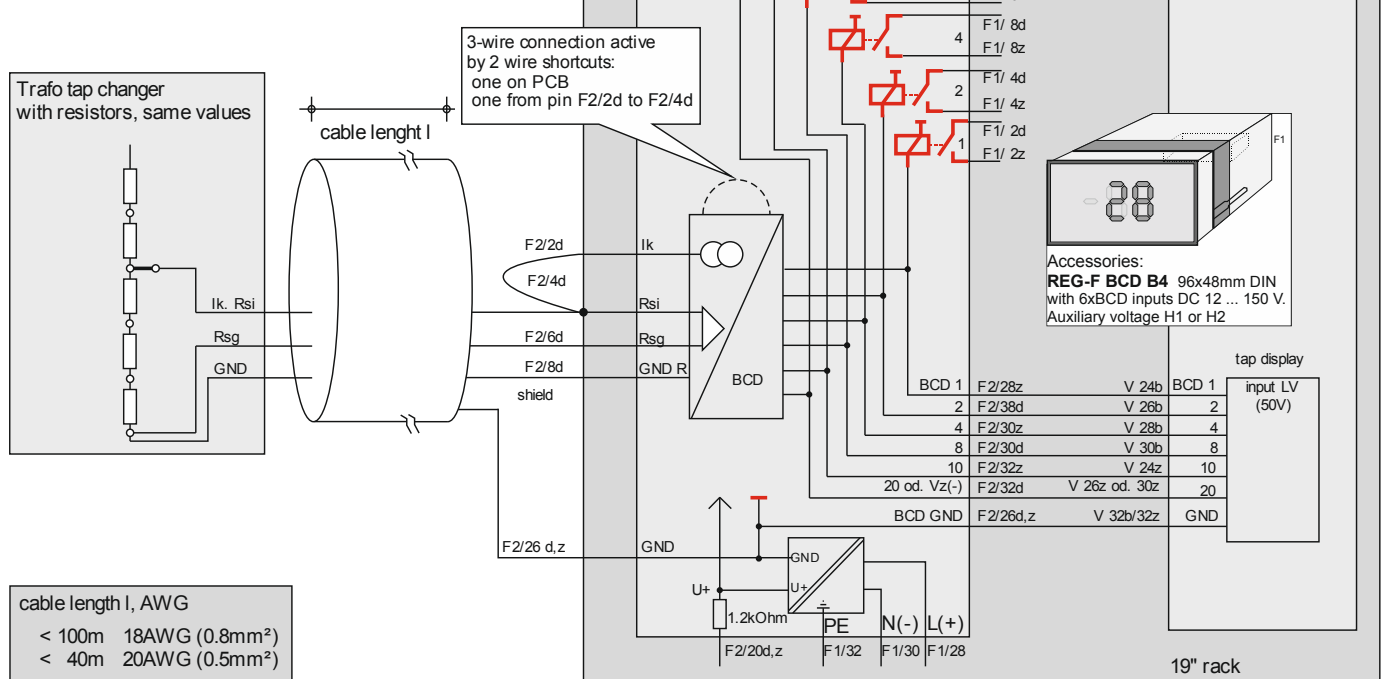
Accessories: Control panel 96x48mm with 20 mm display

Application REG-FR B1
19" plug-in module 8TE 3HE

3-wire connection
same wire resistance RL in wire Ik and GND

For longer distances between REG-FR and the step resistance Rs, the maximum cable length is less due to the DC resistance (see example), but rather determined by interference from parallel cables. A superimposed AC voltage up to 0.3 V at the REG-FR input is allowed. Each application has different earthing and voltage conditions. It can only be said in general, with shielded cables and greater distance to the parallel cables, a longer distance are possible.

Calculate example cable length L   Wire Gauge 20AWG A=0.5mm² (four-wire with each d=0.8mm, shielded)
RL line= supply or return line = 12Ω   rho CU 0.02 for solid wire   L= R x A / rho = 12 x 0.5 / 0.02 = 300 m
12Ω 0.5mm² results 300m wire length. The interface can compensate the DC resistor of this wire. No interference was considered.

Adjust step resistance Rs with the front panel potentiometer R to ±0.2% accuracy. Is the Step resistance not exactly known, an LED in the '+' measuring socket indicates the respective step centre.

When the step resistance Rs >100 Ω/step, the 2-wire circuit can be used. For this case, bridge pins F2/ 6d - 8d and F2/2d - 4d.

If a different code table is needed, please place this when ordering. Example: -9 ... -0 …19
A subsequent change via solder bridges is possible. There is a separate description on request available.