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Device: Fieldbus barrier /
field device
Type: coupler
9411/11

Company: R. Stahl Schaltgeräte GmbH
74638 Waldenburg

The fieldbus coupler 9411/11 connects a main fieldbus line designed according to explosion protection type "Increased safety" (EEx-e) with four or eight (EEx-e) fieldbus output lines depending on the version. All output channels are equipped with an integrated short-circuit current limitation. The field device coupler is suitable for Foundation Fieldbus H1 and Profibus PA. The device is fitted with an integrated terminal resistor which can be connected via jumpers. The LED integrated in the enclosure indicates the power supply of the field device coupler. The eight LEDs of the single channels indicate short circuits occurring at the corresponding channel.



Conclusion:

The field device coupler 9411/11 achieved very good results in all tests.

A) Manufacturer's data

Device designation:	Field device coupler
Type/version:	9411/11-220-40
Serial no. :	007022DE0061
Input voltage in V (on-site):	12 V...32 V
Ambient temperature:	-40...+70°C
EMC:	EN 61326 (IEC/EN 61000-4-1...6, 11; EN 55022 class B) Namur NE21 (IEC/EN 61000-4-1...6, 8, 11; EN 55022 class B)
Protection type enclosure:	IP30
Explosion protection: EC type examination certificate no.:	II 2 G Ex mb e II T4 BVS 06 ATEX E 003 X
Weight:	933g
Dimensions (L x W x D):	128 mm x 209 mm x 82 mm

B) In-house measurements

General setup:	Power supply: Laboratory power supply unit 24 V Power-Conditioner: Relcom IPM 350 mA terminal resistor set at the device Load resistors spurs: 670 Ω corresponding to ~40 mA
Spur voltage, no-load operation:	27.9 V Spur
voltage, full load operation:	25.9 V
Current consumption at the trunk, no-load operation:	26.2 mA
Current consumption at the trunk, full load operation:	335.1 mA
No-load losses, no-load operation:	0.69 W
No-load losses, full load operation:	0.9 W
Reaction in case of undervoltage, full load:	$U_{Bus} \leq 12 \text{ V}$ / no problems
Reaction in case of overvoltage, full load:	$U_{Bus} \leq 38.4 \text{ V}$ / no problems

Starting current at the trunk:

Measured: trunk current exceeding 10 Ω
Series resistor (cursor V1)

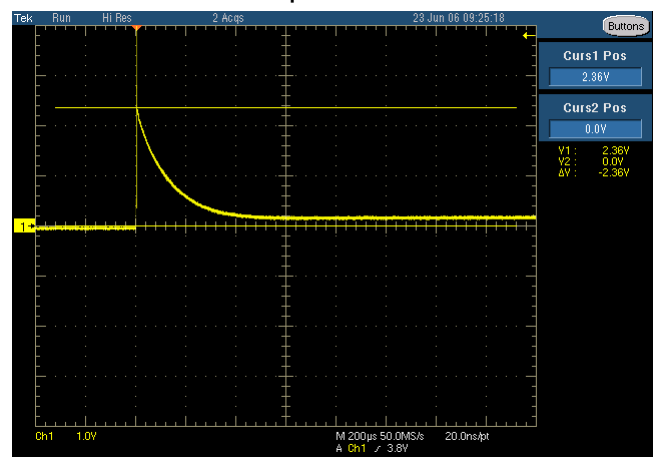
No-load operation

Result:

Max. 236 mA

Passed

See remarks



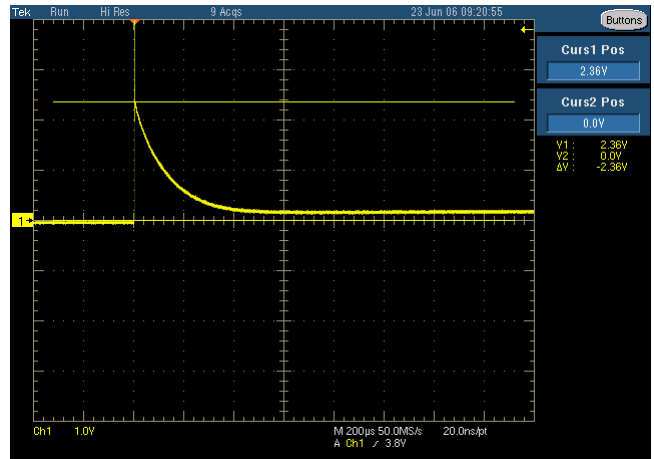
III. 1

Starting current at the trunk:

Measured: trunk current exceeding 10 Ω
Series resistor (cursor V1)

Full load

Result:
Max. 236 mA
Passed
See remarks



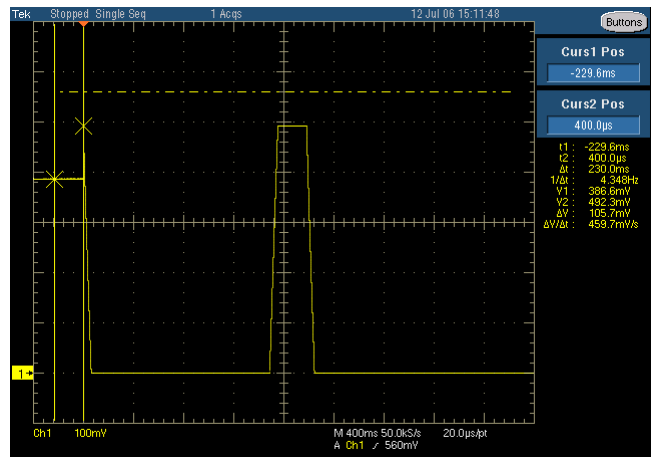
III. 2

Short circuit current at the spur:

Measured: spur current exceeding 10 Ω
Series resistor (cursor V1/V2)

Full load
Spur 2 when t = 0 short-circuited

Result:
Max. 49.2 mA
Passed



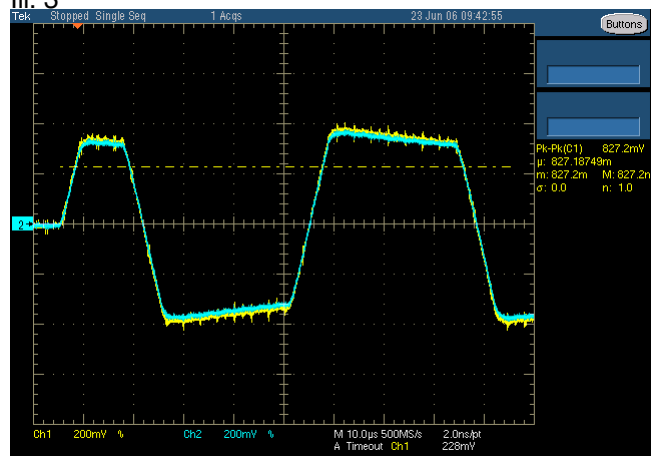
III. 3

Signal curve in transmission:

Measured:
Yellow signal: input signal at the trunk
Blue signal: output signal at spur 1

Full load, resistive load at spur 1

Result:
No problems
Passed



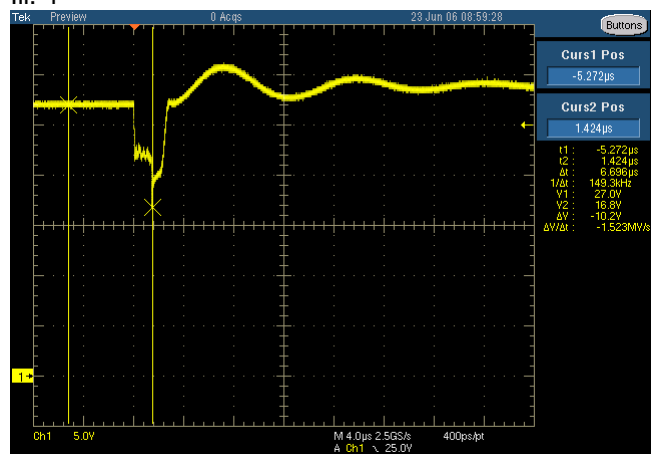
III. 4

Effects on trunk in case of short-circuit at spur:

Measured: voltage at trunk

Full load
Spur 1 when t = 0 short-circuited

Result:
Voltage dip ~5 V for ~3 µS
Passed
See remarks



III. 5

Effects on neighboring channel in case of short-circuit at spur:

Measured: voltage at spur 1

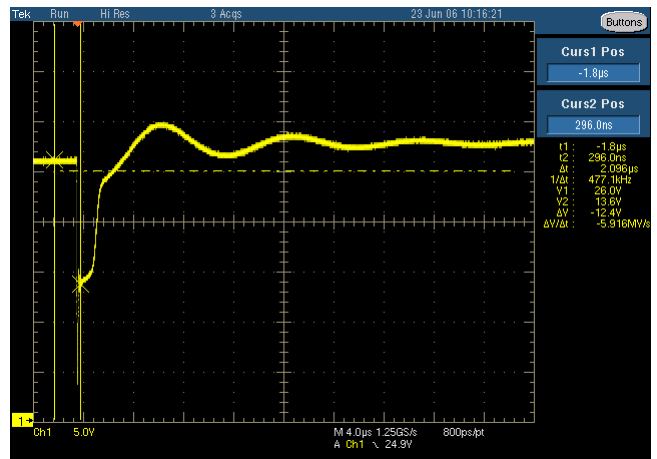
Spur 2 when $t = 0$ short-circuited
Spur 1, 3...8 ~40 mA

Result:

Voltage dip ~12 V for ~1 μ S

Passed

See remarks



Change in temperature +25°C, -20°C, +70°C:
admissible -40°C...70°C
tested -20°C...70°C

Measured: voltage at field device spur 1
In the case of a short-circuit of a neighboring channel and in addition the general communication parameters of the bus.

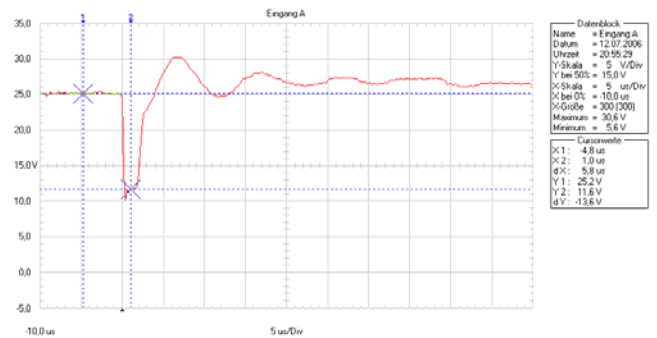
Spur 1 ~40 mA, at $t = 0$ short-circuited
Spur 2 FF field device
Spur 3...8 ~40 mA

Results

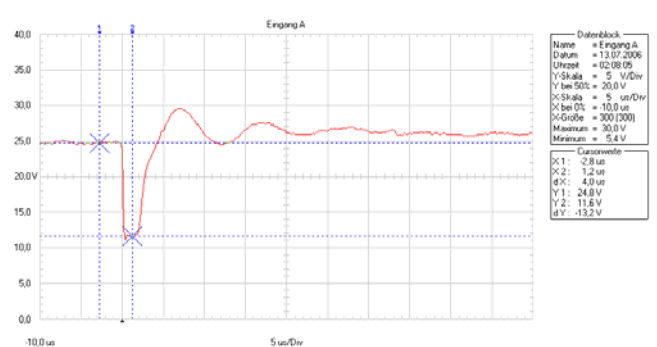
No changes occurred when testing the effects compared with the room temperature.

The communication parameters of the fieldbus on all temperature points did not change.

III. 6



III. 7 Effect at -20 °C



III. 8 Effect at +70 °C

Repair evaluation
Construction:

Mounting evaluation
Installation effort:

Compatibility with standardized mounting concepts:
Electrical connections:

Enclosed housing, impossible for the user to open it.

Mounting on DIN mounting rail in the switch cabinet or mounting with built-in housing on a frame system.

No objections

The field device coupler is available with spring-type and screw-type terminals. The screen of the fieldbus cable can be connected directly to ground via an integrated metallic bus bar depending on the screening concept. It is also possible to capacitively ground the bus screen via the screen terminals.

*See remarks

Explosion evaluation:

No objections

Check of the device documentation:

The present documentation was complete and easy to understand. The possible connection types are very well illustrated. The documentation was available in German language.

C) Remarks

EMC:

- See test report no. IGR110613

Communication / electrical reaction:

- The field device coupler achieved very good results in all communication-specific tests. A self-influence on the fieldbus signal could not be measured.
- The results of the tests of the starting current and the effects between spur and trunk are only of short duration so that an influence on the remaining segment can be excluded.

Operation:

- Only one field device is allowed for each spur. This corresponds to the standard requirement.
The maximum number of field device couplers connected to one trunk is limited to 4 devices.

Mounting:


- The setting of the terminal resistor jumper for the models with spring-type terminals is very complicated since two spring-type terminals must be opened at the same time.

Remark of the manufacturer: A suitable mounting tool is available as an accessory.

Operation/maintenance:

- All terminals are easily accessible, the ground rail makes it possible to connect the screen of the fieldbus cable over a large area.
- The operating and error state LEDs of the device are clearly visible and easy to understand.
- The Power-Management integrated in the device functions perfectly. Typical faults, such as undervoltage at the trunk, short circuit at the spur or excessive starting current of the barrier are thus regulated completely.
- For the calculation of the maximum admissible cable lengths, the software tool "Fieldbus-Wizard" is available as an option from the manufacturer.

gez. Dietz


Prüflabor

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Fachreferent