Typ/Type
9170/21-30-10

Schaltverstärker - Ableitüberwachung
Switching repeater - Leakage Monitor

Betriebsanleitung
Operating Instructions

Inhaltsverzeichnis

Content

1 Safety instructions

The most important safety instructions are summarised in this chapter. It is intended to supplement the relevant regulations which must be studied by the personnel responsible.

When working in hazardous areas, the safety of personnel and plant depends on complying with all relevant safety regulations. Assembly and maintenance staff working on installations therefore have a particular responsibility. The precondition for this is an accurate knowledge of the applicable regulations and provisions.

When installing and operating the device, the following are to be observed:

- Read and observe the safety notes in these operating instructions!
- Ensure that the contents of these operating instructions are fully understood by the personnel in charge.
- Use the device in accordance with its intended and approved purpose only.
- Before installation, make sure that the device is not damaged.
- The national installation and assembly regulations (e.g. IEC/EN 60079-14) apply.
- The switching repeater may be installed in Zone 2, Zone 22 or outside the explosion hazard areas.
- In the case of operation in Zone 2 or Zone 22, the switching repeater must be fitted in an enclosure which complies with the requirements of IEC/EN 60079-0.
- When used in Zone 2 and Zone 22, intrinsically safe devices of Zones 1, 0, 21 and 20 may be connected to the intrinsically safe input circuits.
- The switching repeater may only be connected to devices which will not be subjected to voltages higher than AC 253 V (50 Hz).
- The safe maximum values of the connected field device(s) must correspond to the values of the data sheet or the EC-type examination certificate.
- Interconnecting several active devices in an intrinsic safety circuit may result in other safe maximum values. This could endanger the intrinsic safety!
- Circuits with type of protection 'Ex i' operated with circuits with other types of protection can no longer be operated as circuits with type of protection 'Ex i' after that.
- National safety and accident prevention regulations
- The device may only be installed and operated if it is in an undamaged, dry and clean state.

DANGER

Explosion hazard due to modifications and alterations to the device!
Non-compliance results in severe or fatal injuries.

- Do not modify or alter the device. No liability or warranty for damage resulting from modifications and alterations.

2 Conformity to standards

The switching repeaters types 9170 comply with the following standards and directives:

- Directives 2014/34/EU (ATEX), 2014/30/EU (EMC) und 2011/65/EU (RoHS)
- EN 60079-0, EN 60079-11, EN 60079-15, EN 50303
- EN 50178, EN 61010-1
- EN 61326-1
- EN 50581

3 Function

The leakage monitor monitors a predefined resistance. The measurement circuit is intrinsically safe Ex ia. If the limit value is reached the relay is energized a contact is closed. The leakage monitor offers two galvanically isolated channels.

4 Marking and technical data

Manufacturer	R. STAHL	
Type designation	9170/21-30-10	
CE marking	CE 0158	
ATEX marking of explosion protection	⟨Ex⟩ II 3 (1) G Ex nA nC [ia Ga] IIC T4 Gc	
and	⟨Ex⟩ II (1) D [Ex ia Da] IIIC	
Testing authority and certificate number	DMT 02 ATEX E 195 X	
IECEx marking of explosion protection	Ex nA nC [ia Ga] IIC T4 Gc	
and	[Ex ia] IIIC	
Testing authority and certificate number	IECEx BVS 09.0041X	
Max. ambient temperature range	-20 °C … + 70 °C (See chapter 5.1)	
Safety data	1 channel	2 channels parallel
Max. voltage U_o	9.6 V	9.6 V
Max. current I_o	10 mA	20 mA
Max. power P_o	24 mW	48 mW
Internal capacitance C_i	2.42 nF	4.84 nF
Internal inductance L_i	negligible	negligible
Max. connectable capacitance, C_o IIC / IIB	3.6 µF / 26 µF	3.6 µF / 26 µF
Max. connectable inductance, L_o IIC / IIB	350 mH / 1000 mH	90 mH / 340 mH
Insulation voltage U_m	253 V	253 V

See EC-type examination certificate for further information and value combinations.

Technical data (excerpted from the data sheet)	
Power supply	
Nominal voltage U_N	24 V DC
Nominal current (for U_N) supply	50 mA
Power consumption (for U_N)	1.2 W
I.S. Input	
Resistance for ON	≤ 20 kΩ
Resistance for OFF	≥ 50 kΩ
Output (see Operation and operational states)	
Signal relay	max. 125 V AC/DC / 1 A
Ambient conditions	
Max. operating temperature	-20...+70 °C
Storage temperature	-40...+80 °C
Relative humidity (no condensation)	< 95 %
Use at height of	< 2.000 m

Additional technical data can be found in the current data sheet.

Please consult with the manufacturer before operating under conditions which deviate from the standard operating conditions.

5 Engineering

5.1 Max. ambient temperatures

The ISpac isolators can be used over a wide temperature range. Depending on the isolator version and installation method different maximum ambient temperatures may result.

	Ventilation:	**Without ventilation**		
	Installation:	Single unit	DIN-rail	
	Orientation:	any	vertical	any
Channels	**type:**			
2	**9170/21-30-10**	70 °C	55 °C	60 °C
	Ventilation:	**With ventilation**		
	Installation:	Single unit	DIN-rail	
	Orientation:	any	vertical	any
Channels	**type:**			
2	**9170/21-30-10**	70 °C	65 °C	65 °C

5.2 Power dissipation

Data sheets are describing the maximum power dissipation in standard operation. In practice not all isolators are working with full load. Therefore engineering is done typically with an average power dissipation of 70 % ($P_{70\%}$).

Type	Channels	max. power dissipation	70 % power dissipation
9170/21-30-10	2	1.2 W	0.8 W

5.3 Engineering of the power dissipation in cabinets

When electronic devices are integrated in cabinets free air movement is restricted and the temperature rises. To minimise the temperature rise it is important to optimise the power dissipation as well as the elimination of the produced heat inside a cabinet.

a) Natural Convection in closed cabinets

- Application: when the dissipated power is moderate and when the system operates in a dusty or harsh environment
- Calculation of the maximum allowed power dissipation:

$P_{max} = \Delta t * S * K$

P_{max} [W]	max. allowed power dissipation in the cabinet
Δt [°C]	max. allowed temperature rise
S [m²]	free, heat emitting surface of the cabinet
K [(W/m²*°C)]	thermal emitting coefficient (K=5.5 for painted steel sheets)

The calculated value for P_{max} has to be smaller than the total average power dissipation (70 % of max. power dissipation) of the installed isolators: $P_{max} < \sum P_{70\%}$

b) Natural convection in open cabinets

- Function: the heat is removed by cool air flowing through the devices

- Requirements:
  - inlet and outlet ports in the lower and upper ends of the cabinet
  - the air flow path must be kept free from obstacles.
- Result: Depending on the engineering the improvement can reach a **two times higher** power dissipation as with a)

c) Forced ventilation with heat exchanger in closed cabinets

- Application: when either the harsh environment or the high dissipated power do not allow natural convection
- Function: a heat exchanger with a fan pulls the air into the cabinet and pushes it into the heat exchanger plates that are cooled by the external ambient air moved by a second fan.
- Result: Depending on the engineering the improvement can reach a **5 or 6 times higher** power dissipation as with a)

d) Forced ventilation in open cabinets

- Function: the filtered air is taken from the bottom cabinet openings by one or more fans, flows through the devices, and finally exits at the top of the cabinet.
- Calculation of the required air flow:

$$\mathbf{Q = (3.1 * P_{70\%}) / \Delta t}$$

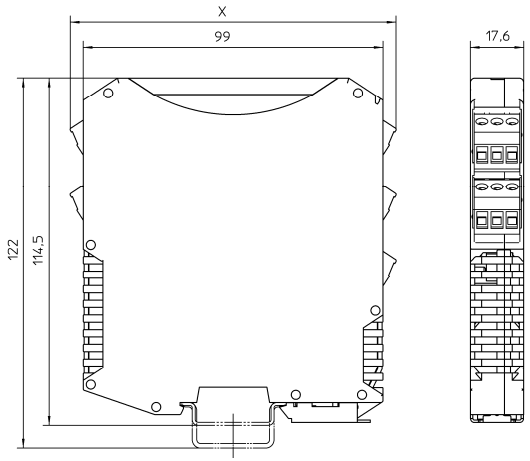
Q [m³/h]	required air flow
$P_{70\%}$ [W]	dissipated power (70 % of max. power dissipation)
Δt [°C]	allowed temperature rise in the cabinet

e) Air conditioned cabinets

- Application: for hot climates - it is possible to reach a cabinet temperature equal or even lower than the ambient temperature
- Function: a specific refrigerating system or the existing air conditioning system can be used for cabinet conditioning

6 Arrangement and fitting

6.1 Dimensions



	Size X
Screw terminals	108 mm

6.2 Installation

The switching repeater is to be installed outside of hazardous areas.
The switching repeater has to be installed in Zone 2, Zone 22 or outside hazardous areas.
In the case of operation in Zone 2 or Zone 22, the isolating power supply must be fitted in an enclosure, which complies with the requirements of IEC/EN 60079-0

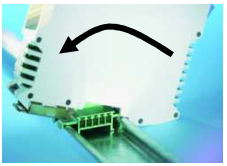
6.3 Mounting and dismounting

a) Detachable terminals

All devices are provided with detachable terminals. A screwdriver is needed to remove the terminals (as shown in the picture).

b) Mounting on DIN rails

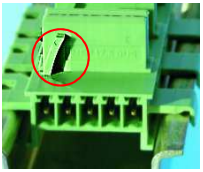
Set the device on the DIN rail and tilt/snap onto the rail as depicted.
Do not tilt at an angle to either side when snapping onto the rail.
To dismount, use a screwdriver to gently pry up the lock on the mounting foot and then remove the module.



c) Mounting on DIN rails fitted with a pac-Bus

As depicted in the photo, set the device in position on the pac-Bus (already mounted on the DIN rail) and tilt/snap until it locks in.
Do not tilt at an angle to either side when snapping onto the pac-Bus.

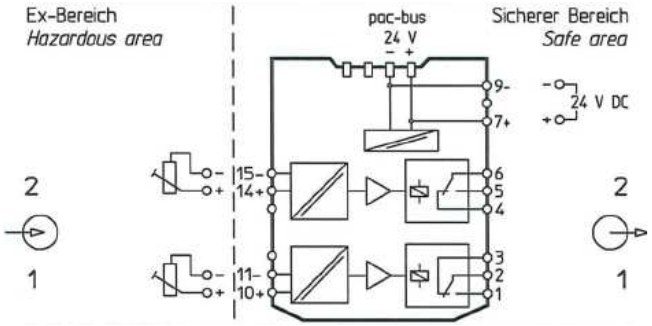
Note: In order to prevent pole reversal during installation, the pac-Bus elements have been equipped with a keyed connection plug (see photo).
The module is fitted with a matching slot.



Dismount as described below in b).

7 Commissioning

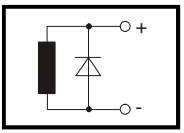
7.1 Connections



7.2 Engineering

Mode of connection for inductive load at the output:

Inductive loads have to be connected with a free wheel diode in parallel.
We do not recommend using a varistor.



7.3 Settings

	Line of action inverted (INV)	
	OFF *)	**ON**
Channel 1	OFF ON 1 LF1 INV1	OFF ON 1 LF1 INV1
Channel 2	2 LF2 INV2	2 LF2 INV2

*) Default factory setting

Changing settings via DIP switches during operation is also permitted in Zone 2 and on circuits carrying intrinsically-safe input signals.

8 Maintenance and repair

Repair work on the devices must be performed only by R. STAHL Schaltgeräte GmbH.

The devices are maintenance-free.

If the device does not work properly, please contact your local R. STAHL sales and service representative. In order to quickly process your request, please provide us with the following information:

- Type and serial number
- Purchase date
- Description of malfunction
- Application description (particularly the configuration of the input/output circuitry)

9 Accessories and spare parts

Use only original spare parts from R. STAHL Schaltgeräte GmbH.

EU-Konformitätserklärung / *EU-Declaration of Conformity*

EU-Konformitätserklärung
EU Declaration of Conformity
Déclaration de Conformité UE

R. STAHL Schaltgeräte GmbH • Am Bahnhof 30 • 74638 Waldenburg, Germany
erklärt in alleiniger Verantwortung / *declares in its sole responsibility* / *déclare sous sa seule responsabilité*

dass das Produkt: *that the product:* *que le produit:*	**Schaltverstärker** *Switching Repeater* *Relais Amplificateur*
Typ(en) / *type(s)* / *type(s):*	**9170/ab-cd-ef (a = 1, 2 ; b = 0, 1, 2 ; c = 1 - 6 ; d = 0 - 4 ; e = 1, 2 ; f = 0 - 3)**

mit den Anforderungen der folgenden Richtlinien und Normen übereinstimmt.
is in conformity with the requirements of the following directives and standards.
est conforme aux exigences des directives et des normes suivantes.

Richtlinie(n) / *Directive(s)* / *Directive(s)*	Norm(en) / *Standard(s)* / *Norme(s)*
2014/34/EU **ATEX-Richtlinie** *2014/34/EU* *ATEX Directive* *2014/34/UE* *Directive ATEX*	EN 60079-0:2012/A11:2013 EN 60079-11:2012 EN 60079-15:2010 EN 50303:2000
Kennzeichnung für / *marking for* / *marquage pour:* **9170/**-**-2*** **9170/**-*d-1* (d = 2, 3)**	**II (1) G [Ex ia Ga] IIC** **II (1) D [Ex ia Da] IIIC** CE 0158
Kennzeichnung für / *marking for* / *marquage pour:* **9170/**-*d-1* (d = 0, 1, 4)**	**II 3 (1) G Ex nA nC [ia Ga] IIC T4 Gc** **II (1) D [Ex ia Da] IIIC** CE 0158
Kennzeichnung für / *marking for* / *marquage pour:* **9170/*2-12-*3**	**II (1) G [Ex ia Ga] IIC** **II (1) D [Ex ia Da] IIIC** **I (M1) [Ex ia Ma] I** CE 0158
EG-Baumusterprüfbescheinigung: *EC Type Examination Certificate:* *Attestation d'examen CE de type:*	**DMT 02 ATEX E 195 X** (DEKRA EXAM GmbH, Dinnendahlstraße 9, 44809 Bochum, Germany, NB0158)
Produktnormen nach Niederspannungsrichtlinie: *Product standards according to Low Voltage Directive:* *Normes des produit pour la Directive Basse Tension:*	EN 50178:1997 EN 61010-1:2010
2014/30/EU **EMV-Richtlinie** *2014/30/EU* *EMC Directive* *2014/30/UE* *Directive CEM*	EN 61326-1:2013
2011/65/EU **RoHS-Richtlinie** *2011/65/EU* *RoHS Directive* *2011/65/UE* *Directive RoHS*	EN 50581:2012

Waldenburg, 2017-03-16 | i.V. | i.V.

Ort und Datum
Place and date
Lieu et date

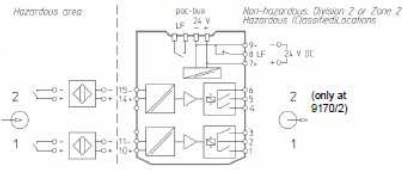
Carsten Brenner
Leiter Geschäftsbereich Automation
Vice President Business Unit Automation
Vice-président Business Unit Automation

Jürgen Freimüller
Leiter Qualitätsmanagement
Director Quality Management
Directeur Assurance de Qualité

FO.DSM-E-322 | Version: 1.0 | Gültig ab: 01.07.2016 | 91 706 01 02 0_07 | 1 / 1

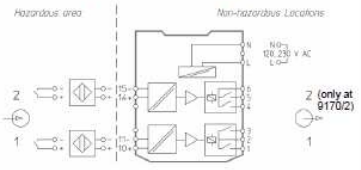
Certification drawing – FM (USA / Canada)

Type 9170/*1-**-1*
(for 24 V DC)



The Switching Repeater Type 9170/*1-*d-1* (d = 0, 1, 4) is an associated apparatus as well as a nonincendive apparatus for installation in non-hazardous or Class 1, Division 2 or Zone 2 Hazardous (Classified) Locations and provides intrinsically safe connections for one (or two) field devices located in Class I, II, III, Division 1, Group A-G or Class I, Zone 0 [AEx ia] Group IIC, hazardous locations according to NEC Article 504/505 as listed below.

Type 9170/*1-**-2*
(for 120 /230 V AC or with power relay)



The Switching Repeater Type 9170/*1-**-2* and Type 9170/*1-*d-** (d = 2, 3) is an associated apparatus located in a non-hazardous location and provides intrinsically safe connections for one (or two) field devices located in Class I, II, III, Division 1, Group A-G, hazardous locations according to NEC Article 504/505 as listed below.

Switching Repeater Type 9170/a1-cd-ef

a = numeral 1 or 2 for number of channels
d = numeral 0, 1, 2, 3 or 4 for output stage
f = numeral 0, 1, 2 or 3 for line fault detection

c = numeral 1, 2, 3, 4, 5 or 6 for input signals
e = numeral 1 or 2 for power supply

Entity parameters for wiring configurations are as follows:

	V_{OC} [V]	I_{SC} [mA]	P_O [mW]	L_o CL I, DIV 1, A,B / Zone 0, GP IIC	L_o CL I, DIV 1, C-G / Zone 0, GP IIB	C_o CL I, DIV 1, A,B / Zone 0, GP IIC	C_o CL I, DIV 1, C-G / Zone 0, GP IIB	V_{max}	I_{max}
Type 9170/*1-c*-** (with c = 1, 3, 4, 5 or 6) input circuits parallel	9.6	10	24	350 mH	1000 mH	3.6 µF	26 µF	-	-
	9.6	20	48	90 mH	340 mH	3.6 µF	26 µF	-	-
Type 9170/*1-2*-** input circuits parallel	9.6	0.61	1.5	1000 mH	1000 mH	3.6 µF	26 µF	-	-
	9.6	1.22	3.0	1000 mH	1000 mH	3.6 µF	26 µF	-	-

Notes:

1. For Connections refer to chapter Commissioning of Operating Instruction ID-No. 91 706 12 31 0.
2. Intrinsically safe apparatus may be switches, thermocouples, LEDs, RTDs or an FM Approved System or Entity device connected in accordance with the manufacturer's installation instructions.
3. For Entity concept use the appropriate parameters to ensure the following:
   V_t or $V_{OC} \leq V_{max}$ $\quad C_o, C_a \geq C_i + C_{leads}$ $\quad P_o \leq P_i$
   I_t or $I_{SC} \leq I_{max}$ $\quad L_o, L_a \geq L_i + L_{leads}$
4. Electrical apparatus connected to an intrinsically safe system should not use or generate voltages > 250 V (U_{max}).
5. Installation should be in accordance with Article 504/505 of the National Electrical Code, ANSI/NFPA 70 and ANSI/ISA RP 12.06.01.
6. Installation in Canada should be in accordance with the Canadian Electrical Code, CSA C22.1, Part 1, Appendix F.
7. Use a general purpose enclosure meeting the requirements of IEC 61010-1 for use in non-hazardous or Class I, Division 2, Hazardous (Classified) Locations.
8. Use an FM Approved Dust-ignition proof enclosure appropriate for environmental protection in Class II, Division 1, Groups E, F and G; and Class III, Hazardous (Classified) Locations.
9. These modules are to be mounted on DIN rail, DIN rail with pac-Bus (type 9194) or pac-Carrier (type 9195). The I.S. field wiring in any case is connected to the ISpac device terminals.
10. Ambient temperature: -20°C ... +70°C (any mounting position).

WARNING: Do not disconnect equipment when a flammable or combustable atmosphere is present.
AVERTISSEMENT: Ne pas débrancher l'équipement en présence d'atmosphère inflammable ou combustible.

The safety relevant statements of this document may be transferred into the operating instructions.
Transferring the text, editorial changes of equivalent meaning are allowed.

			2009	Date	Name	Certification drawing	Scale
			drawn	08.05.	Einsiedler		none
			checked		Kaiser	Switching Repeater Type 9170/*1-**-**	Sheet 1 of 1
02	22.10.12	Reistle			STAHL	91 706 02 31 1	Agency FM
01	15.04.11	Reistle					
Version	Date	Name				Ers. f. / Ers. d.	A4

R. STAHL Schaltgeräte GmbH
Am Bahnhof 30
74638 Waldenburg (Württ.) – Germany
www.stahl.de

ID-Nr. 9170614310 S-BA-9170-Ableit-002 de/en-12/2017