

D5016

I.S. SIL3 2-Wire Active HART® Tx Current Repeater
Models D5016SS, D5016SK, D5016DS, D5016DK



INSTRUCTION MANUAL

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1. CHARACTERISTICS

General Description:

The Current Repeater D5016 module is a high integrity analog input interface suitable for applications requiring SIL 3 level (according to IEC 61508:2010 Ed.2) in safety related systems for high risk industries. It repeats a 2-wire active 4-20 mA current signal input floating circuit to drive a Safe Area load. The module allows bi-directional communication signals, for HART® devices.

Mounting on standard DIN-Rail, with or without Power Bus, or on customized Termination Boards, in Safe Area or in Zone 2.

D5016SS: Single channel, source output. D5016SK: Single channel, sink output. D5016DS: Double channel, source output. D5016DK: Double channel, sink output.

2. TECHNICAL DATA

Supply:

24 Vdc nom (18 to 30 Vdc) reverse polarity protected.

Current consumption: 32 mA (D5016SS), 20 mA (D5016SK), 60 mA (D5016DS), 30 mA (D5016DK) @ 24 Vdc with 20 mA output, typical.

Power dissipation: 0.80 W (D5016SS), 1.00 W (D5016SK), 1.50 W (D5016DS), 1.74 W (D5016DK) @ 24 Vdc with 20 mA output on 250 Ω load and 24 Vdc output supply for sink models, typical.

Isolation (Test Voltage):

I.S. In/Out 2.5 kV; I.S. In/Supply 2.5 kV; I.S. In/I.S. In 500 V; Out/Supply 500 V; Out/Out 500 V.

Input:

4 to 20 mA (separately powered input, voltage drop ≤ 7 V), reading range 0 to 22 mA.

HART Impedance: 225 Ω, typical.

Output:

4 to 20 mA.

Sink out voltage range: 2 to 30 V.

Load range: 0 to 500 Ω, with conventional Tx input 250 Ω nom (160 to 500 Ω), with smart Tx input.

Current limitation: 24 mA (up to 450 Ω load) ≤ max current ≤ 26 mA.

Response time: 20 ms (10 to 90 % step change).

Performance:

Ref. Conditions: 24 V supply, 250 Ω load, 23 ± 1 °C ambient temperature.

Calibration accuracy: ≤ ± 20 μA.

Linearity accuracy: ≤ ± 20 μA.

Supply voltage influence: ≤ ± 4 μA for a min to max supply change.

Load influence: $\leq \pm 4 \mu\text{A}$ for a 0 to 100 % load resistance change.

Temperature influence: $\leq \pm 2 \mu\text{A}/^\circ\text{C}$.

Compatibility:

CE mark compliant, conforms to Directives: 2014/34/EU ATEX, 2014/30/EU EMC, 2014/35/EU LVD, 2011/65/EU RoHS.

Environmental conditions:

Operating: temperature limits – 40 to + 70 °C, relative humidity 95 %, up to 55 °C.

Max altitude: 2000 m a.s.l.

Storage: temperature limits – 45 to + 80 °C.

Safety Description:

ATEX: II 3(1)G Ex ec [ia Ga] IIC T4 Gc, II (1) D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I

IECEx: Ex ec [ia Ga] IIC T4 Gc, [Ex ia Da] IIIC, [Ex ia Ma] I

UL: NI / I / 2 / ABCD / T4, AIS / I, II, III / 1 / ABCDEFG, AEx ec [ia Ga] IIC T4 Gc

C-UL: NI / I / 2 / ABCD / T4, AIS / I, II, III / 1 / ABCDEFG, Ex ec [ia Ga] IIC T4 Gc X

EAC-EX: 2Ex ec [ia Ga] IIC T4 Gc X; [Ex ia Da] IIIC X; [Ex ia Ma] I X

CCC: Ex ec [ia Ga] IIC T4 Gc; [Ex ia Ga] IIC; [Ex ia Da] IIIC

Uo/Voc = 8.8 V, Io/Isc = 0 mA, Po/Po = 0 mW at terminals 7-8 and 9-10,

Ui/Vmax = 30 V, Ii/Imax = 100 mA, Ci = 1.1 nF, Li = 0 nH at terminals 7-8 and 9-10,

Um = 250 Vrms or Vdc, -40 °C \leq Ta \leq 70 °C.

Approvals:

UL 22 ATEX 2892X conforms to EN60079-0, EN60079-11, EN60079-7.

IECEx ULD 22.0034X conforms to IEC60079-0, IEC60079-11, IEC60079-7.

UL & C-UL E222308 conforms to UL61010-1, UL913, UL 121201, UL 60079-0, UL60079-11, UL60079-7 for UL and CAN/CSA C22.2 No. 61010-1-12, CSA C22.2 No. 213, CAN/CSA C22.2 No. 60079-0, CAN/CSA C22.2 No. 60079-11, CAN/CSA No. 60079-7 for C-UL.

EA9C RU C-IT.AA87.B.01310/24 conforms to GOST 31610.0, GOST 31610.7, GOST 31610.11.

CCC n. 2020322316000978 conforms to GB/T 3836.1, GB/T 3834.3, GB/T 3834.4.

SIL 3 conforms to IEC61508:2010 Ed. 2.

Mounting:

EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Board.

Weight: about 135 g (D5016DS and D5016DK), 115 g (D5016SS and D5016SK).

Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm² (13 AWG).

Location: installation in Safe Area or Zone 2, Group IIC T4.

Protection class: IP 20.

Dimensions: Width 12.5 mm, Depth 123 mm, Height 120 mm.

3. ORDERING INFORMATION

3.1 Ordering codes

D5016xy

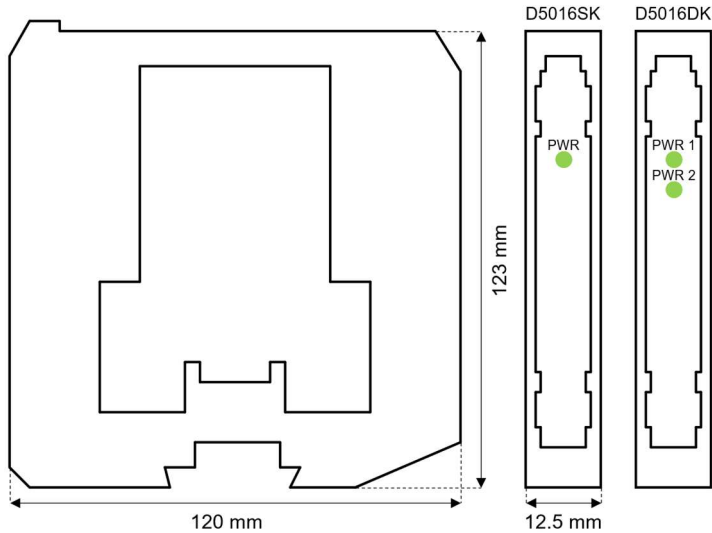
x: S → 1 channel; D → 2 channels

y: S → source current output; K → sink current output

3.2 Accessories

Bus Connector JDFT049, Bus Mounting Kit OPT5096.

4. OVERALL DIMENSIONS



5. TERMINAL BLOCK CONNECTIONS

5.1 Hazardous Side

- 7: + Input Ch 1 for External Powered Transmitters
- 8: - Input Ch 1 for External Powered Transmitters
- 9: + Input Ch 2 for External Powered Transmitters
- 10: - Input Ch 2 for External Powered Transmitters

5.2 Safe Side

- 1: + Output Ch 1
- 2: - Output Ch 1
- 3: + Output Ch 2
- 4: - Output Ch 2
- 5: + Power Supply 24 Vdc
- 6: - Power Supply 24 Vdc

6. VERIFICATION OF INTRINSICALLY SAFE CIRCUITS

In the system safety analysis, always check that field device maximum allowable voltage, current and power are not exceeded by the safety parameters of the associated apparatus connected to it. Check also that added connecting cable and field device capacitance and inductance do not exceed the limits given in the associated apparatus parameters for the effective gas group (Co, Lo, Lo/Ro).

Associated apparatus		Field device
Uo or Voc	≤	Ui or Vmax
Io or Isc	≤	Ii or Imax
Po or Pout	≤	Pi or Pmax
Co or Ca	≥	Ci + Ccable
Lo or La	≥	Li + Lcable
Lo/Ro	≥	Li/Ri and Lcable/Rcable

When used with separate powered intrinsically safe devices, check also that maximum allowable voltage, current and power of the associated apparatus are not exceeded by the safety parameters of the field device.

Associated apparatus		Field device
Ui or Vmax	≥	Uo or Voc
Ii or Imax	≥	Io or Isc

Associated apparatus		Field device
Pi or Pmax	≥	Po or Pout
Ci + Ccable	≤	Co or Ca
Li + Lcable	≤	Lo or La

For installations in which both the Ci and Li of the Intrinsically Safe apparatus exceed 1% of the Co or Ca and Lo or La parameters of the Associated Apparatus (excluding the cable), then 50% of Co or Ca and Lo or La parameters are applicable and shall not be exceeded (50% of the Co or Ca and Lo or La become the limits which must include the cable such that Ci device + C cable ≤ 50 % of Co or Ca and Li device + L cable ≤ 50 % of Lo or La). The reduced capacitance of the external circuit (including cable) shall not be greater than 1 µF for Groups I, IIA (or D), IIB (or C) and 600 nF for Group IIC (or A, B). If the cable parameters are unknown, the following value may be used: Capacitance 200 pF per meter (60 pF per foot), Inductance 1 µH per meter (0.20 µH per foot).

6.1 Intrinsically safe parameters table

	Group	Co or Ca [µF]	Lo or La [mH]	Lo/Ro [µH/Ω]
Term. 7-8, 9-10: Uo(Voc)=8.8 V; Io(Isc)=0 mA; Po(Pout)=0 mW Ui(Vmax)=30 V; Ii(Imax)=100 mA; Ci=1.1 nF; Li=0 µH Characteristic: linear	IIC (A, B)	5.4	1000	
	IIB (C)	45.9	1000	
	IIA (D)	729.9	1000	
	I	999.9	1000	
	IIIC (E, F, G)	45.9	1000	

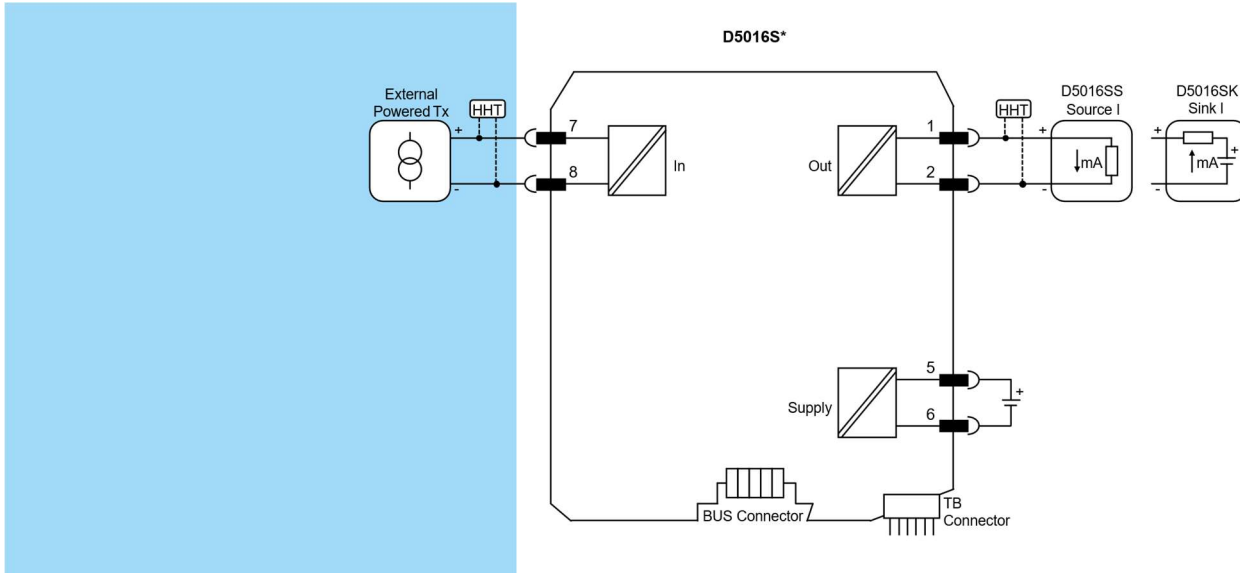
Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is provided between non-intrinsically safe circuits and intrinsically safe circuits. Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is provided between separated intrinsically safe circuits.

IS parameters listed above comply with all applicable certifications for this product. For details regarding IS parameters of a specific certification, please refer to the certificate itself, that can be found on www.gminternational.com website.

7. FUNCTION DIAGRAM

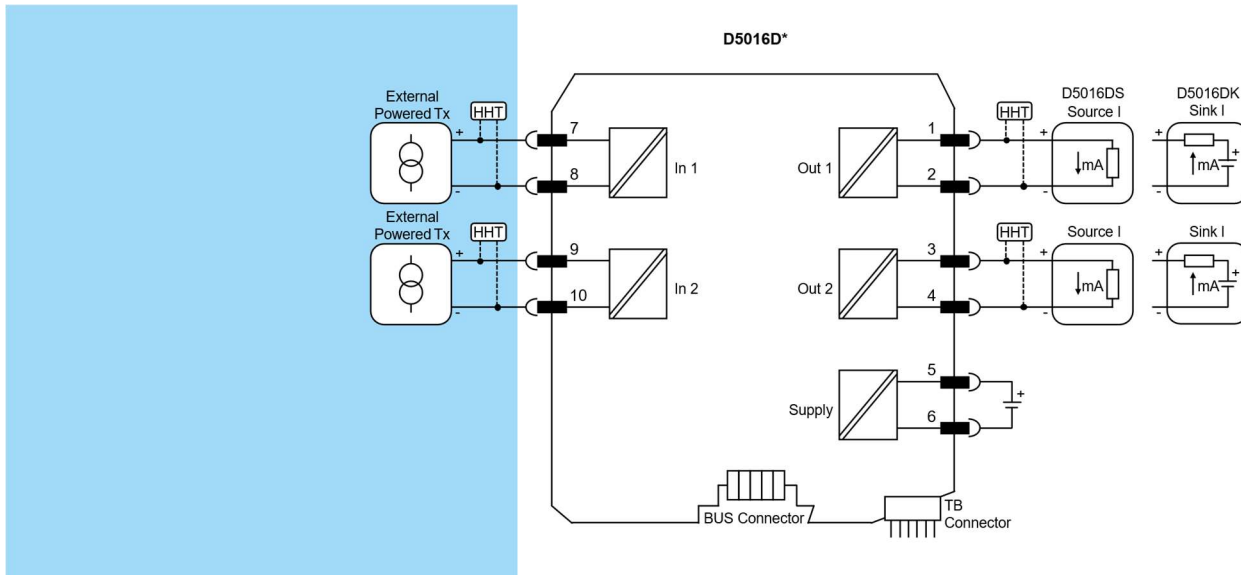
Hazardous Area

Safe Area/Zone 2/Div. 2



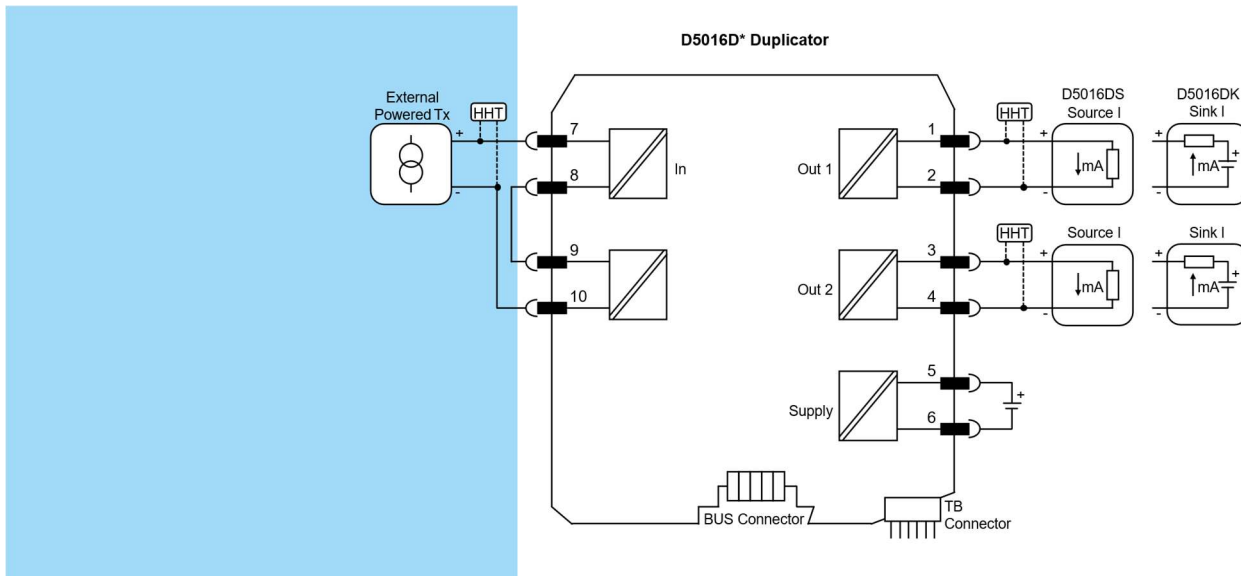
Hazardous Area

Safe Area/Zone 2/Div. 2



Hazardous Area

Safe Area/Zone 2/Div. 2



8. WARNING

D5016 series are isolated Intrinsically Safe Associated Apparatus installed into standard EN/IEC60715 TH 35 DIN-Rail located in Safe Area or Zone 2, Group IIC, Temperature T4 or Class I, Division 2, Group A, B, C, D, T4 Hazardous Area within the specified operating temperature limits T_{amb} -40 to +70 °C, and connected to equipment with a maximum limit for power supply U_m of 250 Vrms or Vdc. Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground.

D5016 series must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards (e.g. EN/IEC60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines)), following the established installation rules, particular care shall be given to segregation and clear identification of I.S. conductors from non I.S. ones.

De-energize power source (turn off power supply voltage) before plug or unplug the terminal blocks when installed in Hazardous Area or unless area is known to be nonhazardous.

Warning: substitution of components may impair Intrinsic Safety and suitability for Zone 2.

Explosion Hazard: to prevent ignition of flammable atmospheres, disconnect power before servicing or unless area is known to be nonhazardous.

Failure to properly installation or use of the equipment may risk to damage the unit or severe personal injury. The unit cannot be repaired by the end user and must be returned to the manufacturer or his authorized representative. Any unauthorized modification must be avoided.

9. OPERATION

D5016 repeats an externally powered 2-wire active 4-20 mA current signal input floating circuit to drive a Safe Area load. The module allows bi-directional communication signals, for HART® devices. A “POWER ON” green led for each channel lits when input power is present.

10. INSTALLATION

D5016 series are Repeater power supply HART® compatible housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Board. D5016 series can be mounted with any orientation over the entire ambient temperature range. Electrical connections are accommodated by polarized plug-in removable screw terminal blocks which can be plugged in/out into a powered unit without suffering or causing any damage (**for Zone 2 installations check the area to be nonhazardous before servicing**). Connect only one individual conductor per each clamping point, use conductors from 0.2 mm² (24 AWG) up to 2.5 mm² (13 AWG) and a torque value of 0.5-0.6 Nm. For USA and Canada installations, use only cables that are suitable for a temperature of at least 75°C. The wiring cables have to be proportionate in base to the current and the length of the cable.

On the section “Function Diagram” and enclosure side a block diagram identifies all connections.

Intrinsically Safe conductors must be identified and segregated from non I.S. and wired in accordance to the relevant national/international installation standards (e.g. EN/IEC60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines)), make sure that conductors are well isolated from each other and do not produce any unintentional connection. Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is provided between non-intrinsically safe circuits and intrinsically safe circuits.

The enclosure provides, according to EN60529, an IP20 minimum degree of protection (or similar to NEMA Standard 250 type 1). The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1. When installed in EU Zone 2, the unit shall be installed in an enclosure that provides a minimum ingress protection of IP54 in accordance with IEC 60079-0. When installed in a Class I, Zone 2 Hazardous Location, the unit shall be mounted in a supplemental AEx or Ex enclosure that provides a degree of protection not less than IP54 in accordance with UL/CSA 60079-0. When installed in a Class I, Division 2 Hazardous Location, the unit shall be mounted in a supplemental enclosure that provides a degree of protection not less than IP54. The enclosure must have a door or cover accessible only by the use of a tool. The end user is responsible to ensure that the operating temperature of the module is not exceeded in the end use application. Units must be protected against dirt, dust, extreme mechanical (e.g. vibration, impact and shock) and thermal stress, and casual contacts. If enclosure needs to be cleaned use only a cloth lightly moistened by a mixture of detergent in water.

Electrostatic Hazard: to avoid electrostatic hazard, the enclosure of D5016 series must be cleaned only with a damp or antistatic cloth.

Any penetration of cleaning liquid must be avoided to prevent damage to the unit.

Any unauthorized modification must be avoided.

D5016 series must be connected to SELV or PELV supplies.

All circuits connected to D5016 series must comply with the overvoltage category II (or better) according to EN/IEC60664-1.

11. START-UP

Before powering the unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires, also check that Intrinsically Safe conductors and cable trays are segregated (no direct contacts with other non I.S. conductors) and identified either by color coding, preferably blue, or by marking.

Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts.

Turn on power, the “power on” green leds must be lit, for 2 wires transmitter connection output signal should be corresponding to the input from the transmitter. If possible change the transmitter output and check the corresponding Safe Area output.