



# INSTRUCTION MANUAL

SIL 2 Powered Isolating Driver  
Hart, DIN-Rail and Termination Board,  
Models D6020S, D6020D



### General Description:

The single and dual channel Isolating Driver, D6020S and D6020D module is a high integrity analog output interface suitable for applications requiring SIL 2 level (according to IEC 61508:2010 Ed. 2) in safety related systems for high risk industries. It isolates and transfers a 4-20 mA signal from a controller to a load up to 700 Ω.

It has a high output capacity of 15 V at 20 mA combined with a low drop across its input terminals.

The circuit allows bi-directional communication signals, for Hart positioner. In the 4-20 mA input range, a field open or short circuit, reflects a high impedance to the control device circuit and actuates (de-energizes) the channel fault output transistor and actuates (energizes) the cumulative fault output available on Power Bus connector. A fault output signal for each channel is available when mounted on customized Termination Board. In addition the single channel D6020S provides open collector transistor output on terminal blocks. Short circuit fault detection can be enabled (two different levels can be selected) or disabled via DIP-Switch programming.

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

### Functional Safety Management Certification:

G.M. International is certified by TUV to conform to IEC61508:2010 part 1 clauses 5-6 for safety related systems up to and included SIL3.



## Technical Data

### Supply:

24 Vdc nom (18 to 30 Vdc) reverse polarity protected, ripple within voltage limits  $\leq 5$  Vpp, 2 A time lag fuse internally protected.

**Current consumption @ 24 V:** 70 mA for 2 channels D6020D, 35 mA for 1 channel D6020S with 20 mA output on 500 Ω load.

**Power dissipation:** 1.3 W for 2 channels D6020D, 0.65 W for 1 channel D6020S with 24 V supply voltage and 20 mA output on 500 Ω load.

### Isolation (Test Voltage):

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

In/Supply 500 V; In/In 500 V; Fault/In 500 V; Fault/Supply 500V; Fault/Fault 500 V.

### Input:

4 to 20 mA with  $\leq 2.5$  V voltage drop, reverse polarity protected in normal operation,  $\geq 5$  KΩ impedance ( $\approx 2$  mA sinking from 10 to 30 Vdc) when fault condition detected.

### Output:

4 to 20 mA, on max. 700 Ω load.

**Response time:** 25 ms (0 to 100 % step change).

**Output ripple:**  $\leq 20$  mVrms on 250 Ω communication load on 0.5 to 2.5 KHz band.

**Frequency response:** 0.5 to 2.5 KHz bidirectional within 3 dB (Hart protocol).

### Fault detection:

field device and wiring open circuit or short circuit detection;

short circuit detection can be disabled via dip-switch.

**Short output detection:** load resistance  $< 50$  Ω or  $< 100$  Ω dip-switch selectable ( $\approx 2$  mA forcing to detect fault).

**Open output detection:** load resistance  $> (21$  V / Loop current) - 300 Ω (for example, if Loop current = 20 mA: load resistance  $> (21$  V / 20 mA) - 300 Ω = 750 Ω).

**Fault signaling:** voltage free NE SPST optocoupled open-collector transistor (output de-energized in fault condition) available when mounted on Termination Board for model D6020D; for model D6020S in addition to Termination Board connection, also available on Safe Area side Terminal Block.

**Open-collector rating:** 100 mA at 35 Vdc ( $\leq 1.5$  V voltage drop).

**Leakage current:**  $\leq 50$  μA at 35 Vdc.

**Response time:**  $\leq 30$  ms.

### Performance:

Ref. Conditions 24 V supply, 250 Ω load,  $23 \pm 1$  °C ambient temperature.

**Calibration accuracy:**  $\leq \pm 0.1$  % of full scale.

**Linearity error:**  $\leq \pm 0.1$  % of full scale.

**Supply voltage influence:**  $\leq \pm 0.02$  % of full scale for a min to max supply change.

**Load influence:**  $\leq \pm 0.1$  % of full scale for a 0 to 100 % load resistance change.

**Temperature influence:**  $\leq \pm 0.01$  % of full scale on zero and span for a 1 °C change.

### Compatibility:

CE mark compliant, conforms to Directives:

2004/108/CE EMC, 2006/95/EC LVD, 2011/65/EU RoHS.

### Environmental conditions:

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

**Storage:** temperature limits - 45 to + 80 °C.

### Approvals:



TUV Certificate conforms to IEC61508:2010 Ed. 2 (Pending).

TUV Certificate No. C-IS-236198-09, SIL 3 Functional Safety Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.

### Mounting:

T35 DIN-Rail according to EN50022, with or without Power Bus or on customized Termination Board.

**Weight:** about 145 g D6020D, 120 g D6020S.

**Connection:** by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm<sup>2</sup>.

**Protection class:** IP 20.

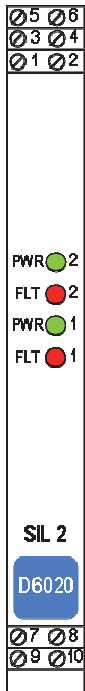
**Dimensions:** Width 12.5 mm, Depth 123 mm, Height 120 mm.

## Ordering Information

Model:	D6020	
1 channel		S
2 channels		D

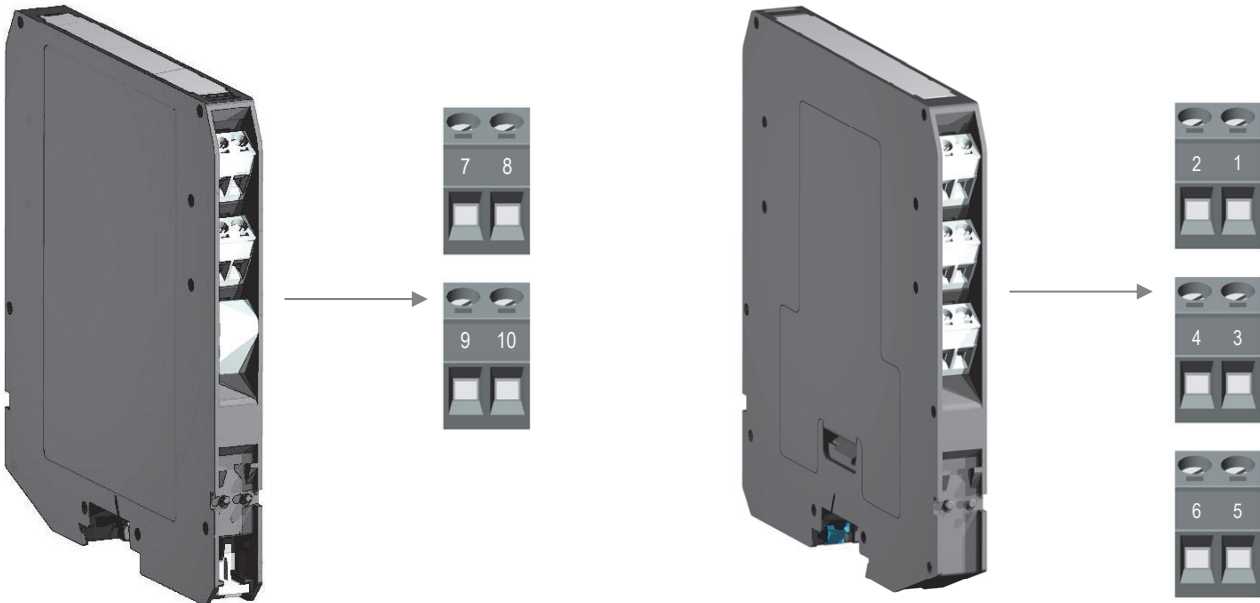
Power Bus and DIN-Rail accessories:  
 Connector JDFT049      Cover and fix MCHP196  
 Terminal block male MOR017      Terminal block female MOR022

## Front Panel and Features



- SIL 2 according to IEC 61508:2010 Ed. 2 for Tproof = 10 / 20 yrs (10 / 20 % of total SIF).
- SIL 1 according to IEC 61508:2010 Ed. 2 for Tproof = 20 yrs (10 % or more of total SIF).
- 2 fully independent channels.
- Output to Zone 0 (Zone 20) / Division 1, installation in Zone 2 / Division 2.
- 4-20 mA Input, Output Signal.
- Hart compatible.
- Field open and short circuit detection and signaling for each channel and cumulative.
- High Accuracy.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.
- In-field programmability by DIP Switch.
- TÜV Functional Safety Certification.
- High Density, two channels per unit.
- Simplified installation using standard DIN-Rail and plug-in terminal blocks, with or without Power Bus, or customized Termination Boards.

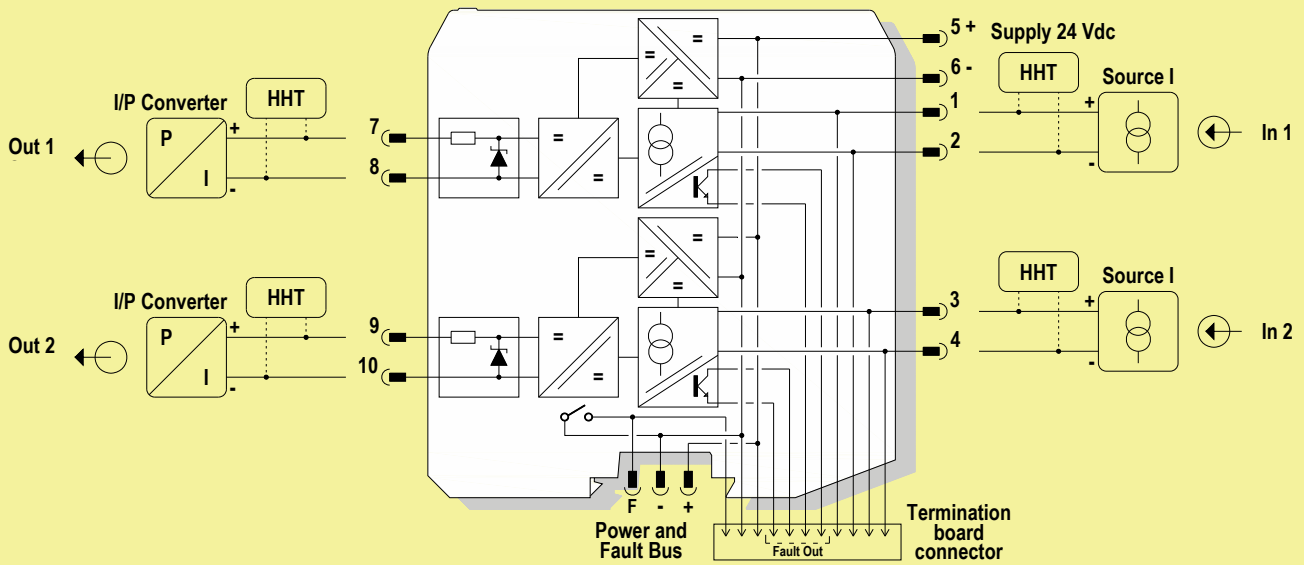
## Terminal block connections



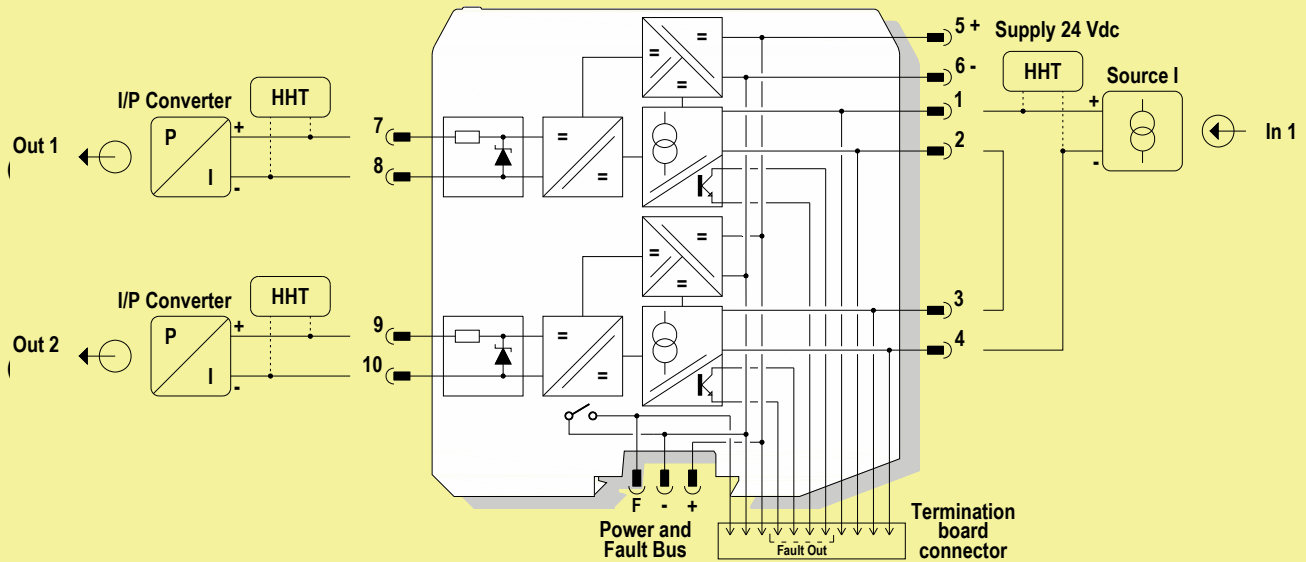
- 7** + Output Ch 1 for I/P Converter
- 8** - Output Ch 1 for I/P Converter
- 9** + Output Ch 2 for I/P Converter
- 10** - Output Ch 2 for I/P Converter

- 1** + Input Ch 1
- 2** - Input Ch 1
- 3** + Input Ch 2 (+ Fault output on D6020S)
- 4** - Input Ch 2 (- Fault output on D6020S)
- 5** + Power Supply 24 Vdc
- 6** - Power Supply 24 Vdc

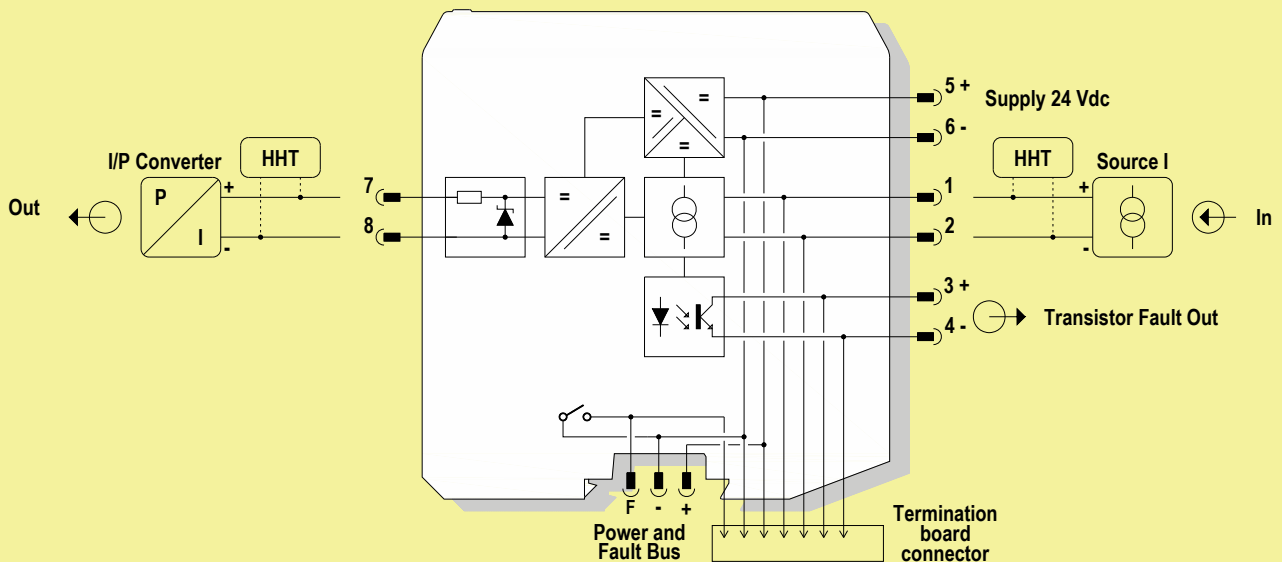
Model D6020D



Model D6020D Duplicator

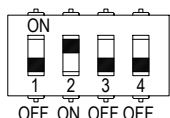


Model D6020S

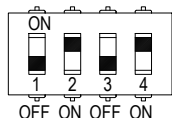


## Configuration

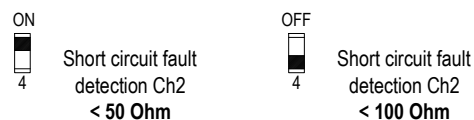
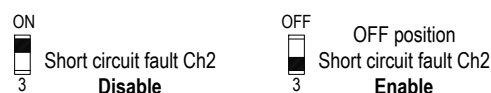
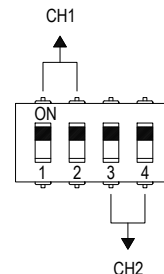
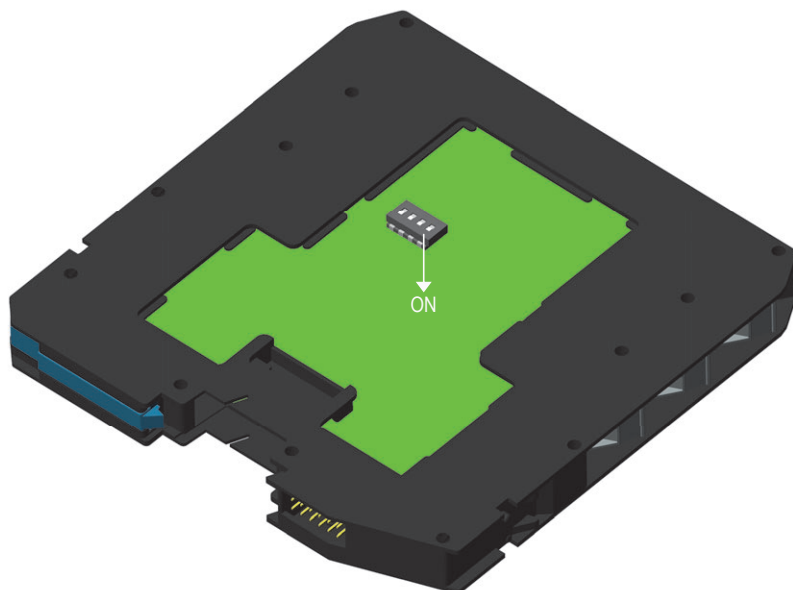
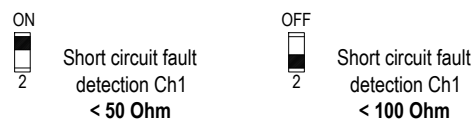
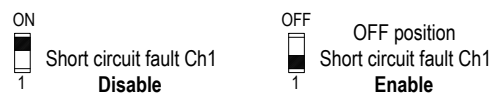
A short circuit fault detection configuration DIP Switch is located on component side of pcb. This switch allows the short circuit fault detection enable and trip level.



D6020S DIP Switch factory settings



D6020D DIP Switch factory settings



## Warning

D6020 series must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards. 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.

## Operation

D6020 isolates and transfers a 4-20 mA signal from a controller to a load up to 700 Ω. It has a high output capacity of 15 V at 20 mA combined with a low drop across its input terminals. The circuit allows bi-directional communication signals, for Hart positioner. In the 4-20 mA input range, a field open or short circuit, reflects a high impedance to the control device circuit and actuates (de-energizes) the channel Fault output transistor and actuates (energizes) the cumulative Fault output available on Power Bus connector. Fault output signal for each channel is available when mounted on customized Termination Board. In addition the single channel D6020S provides open collector transistor output on terminal blocks. Short circuit fault detection can be enabled (two different levels can be selected) or disabled via DIP-Switch programming. Presence of supply power, as well as integrity or fault condition of device and connecting line are displayed by signaling LEDs (green for power and red for fault condition).

## Installation

D6020 series are Isolated Driver hart compatible housed in a plastic enclosure suitable for installation on T35 DIN-Rail according to EN50022, with or without Power Bus or on customized Termination Board.  
 D6020 unit can be mounted with any orientation over the entire ambient temperature range.  
 Electrical connection of conductors up to 2.5 mm<sup>2</sup> 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.  
 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.  
 Identify the number of channels of the specific card (e.g. D6020S is a single channel model and D6020D is a dual channel model), the function and location of each connection terminal using the wiring diagram on the corresponding section, as an example:  
 Connect 24 Vdc power supply positive at terminal "5" and negative at terminal "6".  
 For Model D6020S connect positive input of channel 1 at terminal "1" and negative input at terminal "2".  
 For Model D6020D in addition to channel 1 connections above, connect positive input of channel 2 at terminal "3" and negative input at terminal "4".  
 For Model D6020S connect positive output of fault signaling at terminal "3" and negative output at terminal "4".  
 For Model D6020S connect positive output of channel for I/P Converter at terminal "7" and negative output at terminal "8".  
 For Model D6020D in addition to channel 1 connections above, connect terminal "9" for positive and "10" for negative on channel 2.  
 Connect SPST fault output transistors checking the load rating to be within the maximum rating (100 mA at 35 Vdc (≤ 1.5 V voltage drop)).  
 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.  
 Any penetration of cleaning liquid must be avoided to prevent damage to the unit. Any unauthorized card modification must be avoided.  
 According to EN61010, D6020 series must be connected to SELV or SELV-E supplies.

## Start-up

Before powering the unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Turn on power, the "power on" green led must be lit, output signal should be corresponding to the input from the controller.