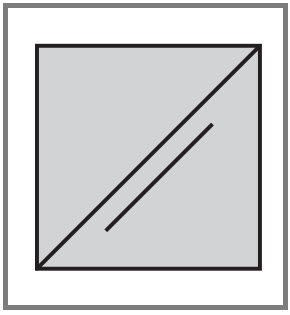
APPLICATION GUIDELINE

Signal Conditioners

Why are Signal Conditioners Used?



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1 Why Are Signal Conditioners Used?

1.1 Reliability and Protection

Avoid Disruptions Caused by Ground Loops

Problems may occur if the signal wires on both sides of the current circuit, on the field side and on the control side (DCS), go to ground. Potential differences between the grounded field side and the grounded control side can bring about current flows through ground loops ($I \neq 0$). These current flows can result in the measuring signal and process signal being falsified.

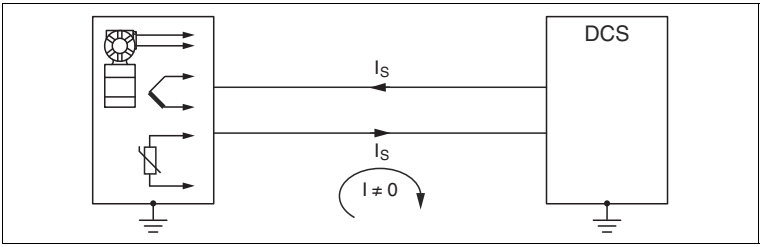

Figure 1.1

Galvanically isolated signal conditioners eliminate ground loops between the field side and the control side ($I = 0$).

Maintenance poses no problem when the control system is updated with new cards with different or unknown groundings.

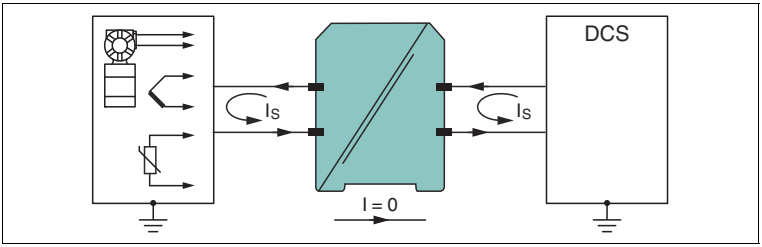

Figure 1.2

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Protection Against Electric Shock and Elimination of Dangerous AC Voltages

In many applications, AC-powered equipment such as pumps, motors, and fans are monitored. To monitor temperature, frequency, or vibration, sensors are installed inside the devices. If wiring faults or isolation issues occur, protection against electric shock is always of great importance. With high operating and test voltages, galvanically isolated signal conditioners protect the control-side equipment against damage caused by dangerous voltage surges.

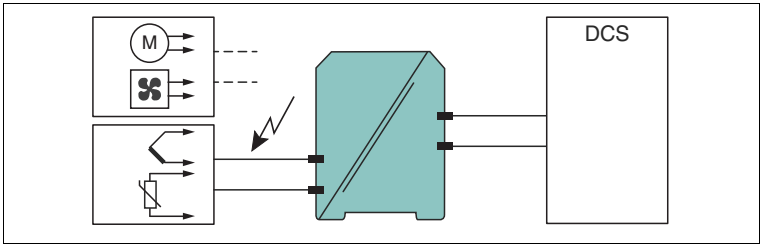

Figure 1.3

Eliminate the Influence of HF and EMC Interference

Variable frequency converters are one cause of common mode noise. Motor load changes and input frequencies create noise that can be coupled onto the wiring of process signal lines. The input filters on isolated signal conditioners prevent faulty process values.

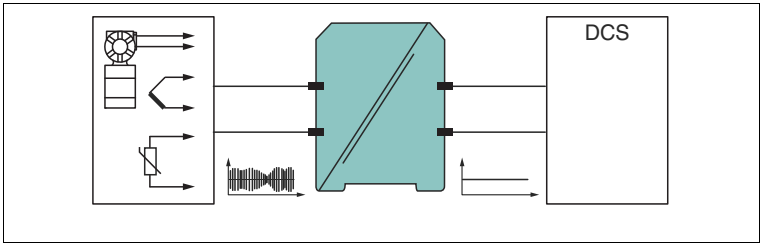

Figure 1.4

1.2 Use of Standard Signals

Signal Conversion

Using signal conditioners, field signals from resistance thermometers, thermocouples, potentiometers, or frequencies are linearized and converted into standard signals.

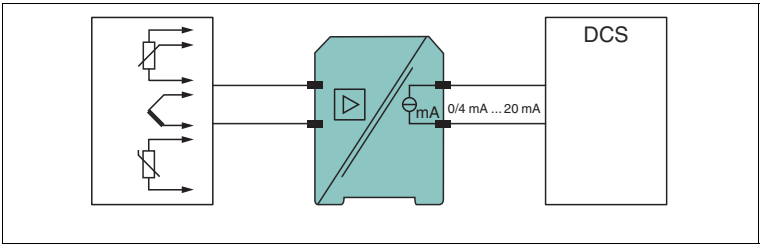

Figure 1.5 Example: conversion into a 0/4 mA ... 20 mA standard signal

1.3 Protected Wiring of Field Signals

Signal Amplification and Protection

Digital sensors/actuators and analog transmitters need a reliable power supply. In the case of single-loop integrity, the field circuits have to be protected against short circuits. Otherwise, the faulty current circuit can shut down the entire supply chain. Short circuits can also damage the wiring.

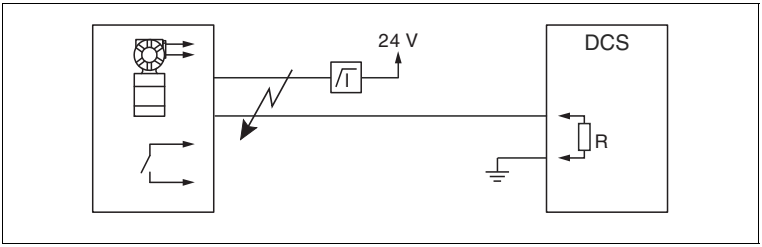

Figure 1.6

A signal conditioner offers short-circuit current limitation for each of the field device's current circuits. This means that other current circuits are not affected should one individual current circuit fail. In the event of a line fault on the field side, the signal conditioner switches the outputs on the control side to a safe state.

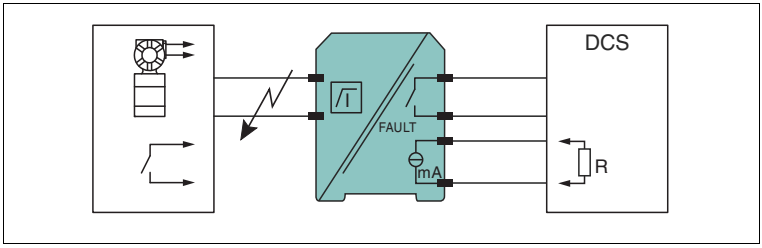

Figure 1.7

This reliable power supply enables high loads to be connected, including the wiring for transmitters and connection of transmitters. High loads are frequently connected to the current circuit on the control side. Signal conditioners can transfer up to 500 Ω to the control side.

1.4 Reliable Distribution

Signal Splitting

Often, field signals need to be shared by various systems, such as control systems, emergency shutdown (ESD) systems, or data acquisition systems. When sharing signals, avoid switching the various systems in series on the output side. If the connection to one of the systems was to be interrupted, none of the other systems would receive a signal either.

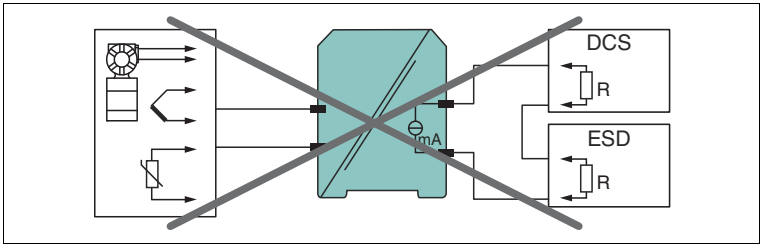

Figure 1.8

The galvanically isolated outputs on a signal splitter guarantee reliable distribution of the process signals to the various systems. The problem of high resistive loads in a series connection is thus avoided.

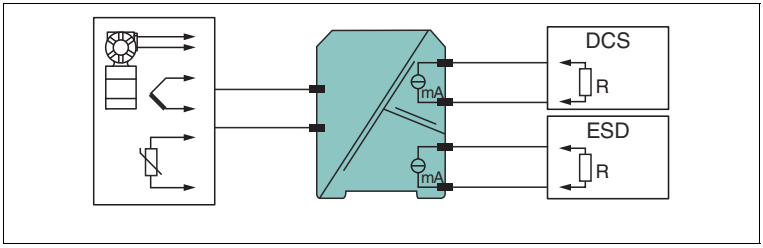

Figure 1.9

1.5 Adaptation of Current Sinks and Sources of Current and Voltage

If field devices such as 4-wire transmitters with active current output and a control system attempt to supply current to the current circuit, the result is a non functioning current circuit. With signal conditioners, you can handle all combinations of current sink and current/voltage sources.

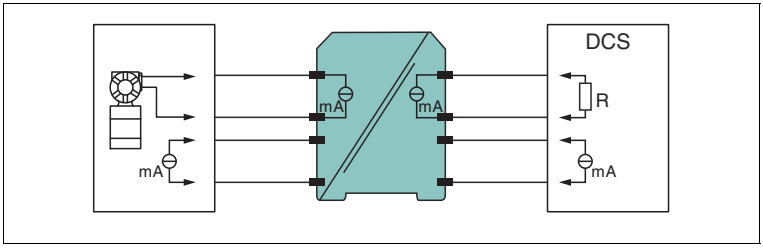

Figure 1.10

2 List of Abbreviations

DCS	**D**istributed **C**ontrol **S**ystem
EMC	**E**lectro**m**agnetic **C**ompatibility
ESD	**E**mergency **S**hut**d**own
HF	**H**igh **f**requency

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