

## FOUNDATION™ fieldbus OVERVIEW



### FOUNDATION™ fieldbus - Topology

The adjacent illustration is a basic overview of FOUNDATION fieldbus (FF) installations.

The DCS or PLC (Host) supplies the H1 (network data) to FF Power Conditioners. The FF network is either hard wired or cordsets and FF spur blocks (JBBS-49.. & JBBS-49.. junction<sup>1</sup> blocks) are used to connect the segments to the field devices. Multiple accessories are available from TURCK including *lokfast*<sup>®</sup> guards for Div 2 or non-incendive areas. The following illustration is broken into two parts for ease of explanation, [A] or [B].

[A] The DPC (Diagnostic Power Conditioner)<sup>2</sup> uses power conditioner modules in a rack to power the field devices with 24 VDC and to transmit the FF H1 data. In this instance, the DPC can power devices in the safe area, in DIV 1 or 2 area when either a TURCK multibarrier (MBD-49..<sup>3</sup>) or a FISCO<sup>7</sup> power supply is used. The DPC is powered by the IM82-2450<sup>4</sup>. The DPC system also provides high-speed Ethernet feedback to the host or to a separate computer for asset management. This feedback is totally separate from the H1 network. An Ethernet switch<sup>5</sup> is shown and can be utilized to communicate with other Ethernet devices.

[B] The second example shows the RPC49-205<sup>6</sup> Power Conditioner (powered by the PSU3214<sup>8</sup>) feeding the field devices in a similar fashion to example [A].

### Communication Signal

The FOUNDATION fieldbus H1 communication signal is a square waveform superimposed on a DC carrier. The frequency of the signal is 31.25 KHz. Although it is not a requirement, most devices derive their supply power from the fieldbus communications cable. The fieldbus specification states that devices must not be polarity sensitive. However, it is good electrical practice to have all devices wired with the same polarities. The voltage range allowed for proper operation is 9 to 32 VDC. A typical fieldbus device will consume 20 mA of current.

### Fieldbus Cable Specifications

The specifications for fieldbus H1 physical media are defined by IEC 61158-2 and the ISA-S50.02 Part 2 Physical Layer Standards. The same standard is also listed in the FOUNDATION fieldbus specifications under 31.25 Kbps Physical Layer Profile FF-816-1.4. There are essentially four types of cable designations for fieldbus (see table). Type A cable is preferred for new installations, because it allows for the most versatile lengths. The other cable types are for installations where cable already exists from 4-20 mA systems.

Type	Type	Cable Description	Conductor Size	Maximum Length
	Type A	Shielded, Twisted Pair	18 AWG	1900 meters (6232 feet)
	Type B	Shielded, Multi-Twisted Pair	22 AWG	1200 meters (3936 feet)
	Type C	Unshielded, Multi-Twisted Pair	26 AWG	400 meters (1312 feet)
	Type D	Shielded, Untwisted Pair	16 AWG	200 meters (656 feet)

## DPC SYSTEM OVERVIEW

The DPC-System (Diagnostic Power Conditioner System) is a power supply system for the installation of FOUNDATION™ fieldbus H1 segments. It provides comprehensive diagnostic functions for monitoring FOUNDATION™ fieldbus segments, and supports asset management for the entire system. This includes asset management of the physical layer which is extremely valuable.

A DPC system consists of one or more module racks (DPC-49-MB-RC) each with up to eight power supply modules (DPC-49-IPS) and one diagnostic module (DPC-49-ADU). Up to four H1 segments for each module rack can be operated and monitored redundantly. The diagnostic data from the H1 segments is transmitted via the HSE interface module (DPC-49-HSEFD/24VDC) to the higher level asset management system.

The diagnostic module (DPC-49-ADU) is used as a communication and diagnostic interface between the H1 segments and the power supply module. The diagnostics module monitors the electrical parameters and the communication parameters of the H1 segments. Operation without diagnostic module is possible. In this configuration, simple diagnostics are provided locally.

The diagnostic information is collected in the device and transmitted via the HSE interface module to the higher fieldbus level (e.g. to the host) as diagnostic and alarm data. The diagnostic module can be plugged and unplugged during operation (hot swappable).

## TEMPERATURE CONVERTERS



Temperature measurement is a very common application, even in hazardous areas. The IM34 temperature converting device provides advanced diagnostics, versatility and convenience in an easy-to-use device.

The IM34 will convert a 2, 3 or 4-wire RTD, mV signal, or T/C in a hazardous area, to an analog 4-20 mA signal in a non-hazardous area. These pushbutton, rotary switch or software (FDT/DTM, free shareware) configurable units are simple to use and save time and money on installations.

These diverse units allow several different input types to be configured and used with common 4-20 mA analog input control cards. Elimination of separate RTD, T/C and mV input cards may consolidate inventory, as well as allow the use of off-the-shelf "Simple Apparatus" components in even the most explosive atmospheres; further reducing costs for installation and maintenance.

### NAMUR Sensors and Junctions

- Class I, Class II, Class III, Division 1 and Division 2 FM approved
- Full line of inductive, capacitive and magnet operated inductive sensors
- Numerous sizes and styles are available
- Eliminates multiple cable runs for wiring IS applications



### ZENER Barriers

- Shunt-diode intrinsic safety barriers
- Meet worldwide standards for use in classified atmospheres



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## TURCK works Industrial Automation

## Intrinsic Safety: Quick Reference Guide

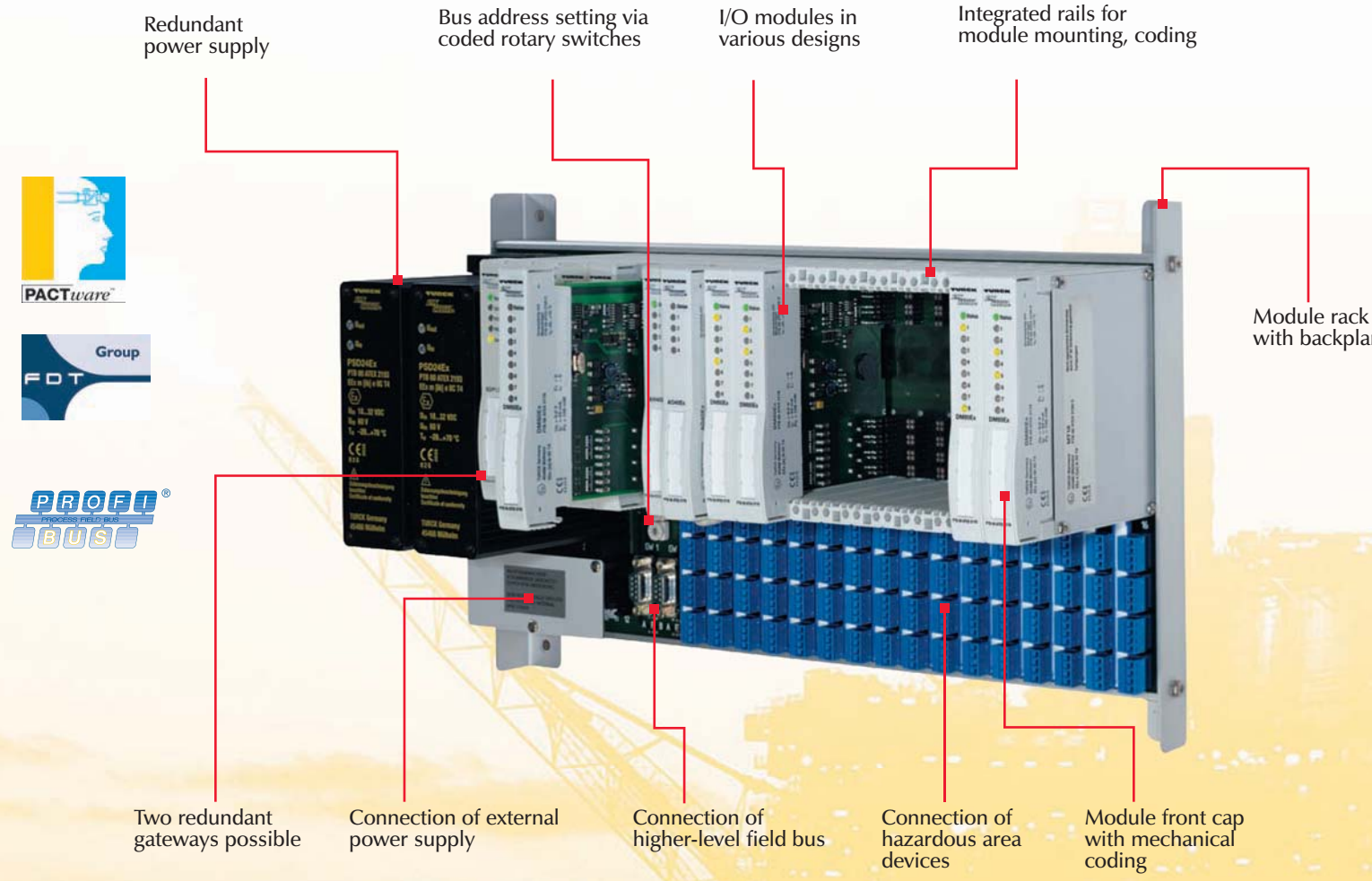


.....Sense It!.....Connect It!.....Bus It!.....Solve It!

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## excom® SYSTEM OVERVIEW



### The excom® System

excom is a remote I/O system for use in hazardous locations consisting of power modules, PROFIBUS®-DP communication gateways, I/O modules and a backplane rack. The backplane is available in two sizes, with support for 8 or 16 I/O modules. The larger rack (MT18-) also allows for redundant power supplies and PROFIBUS-DP gateway cards to be used providing a safe communication scheme.

The I/O modules provide the interface to the field devices. The backplane provides power for the I/O from the mounted power supply, with no need for a separate field supply. The gateways, power supplies and I/O cards are simply plugged into the backplane rack, with all power, PROFIBUS-DP and I/O wiring separate from the removable modules. I/O modules may also be changed during operation ("hot-swappable"). The system automatically checks whether a newly inserted module matches the configuration.

When the excom system is used, the PROFIBUS-DP segment coupler SC12Ex must also be used for the interfacing. The coupler is equipped with one standard RS485 interface and two RS485-IS interfaces that allow redundancy. Optional fiber-optic couplers are also available.

The appropriate D9T-RS485IS D9T-Ex 455-\*M cable is used for the connection of the segment coupler to the excom gateway.

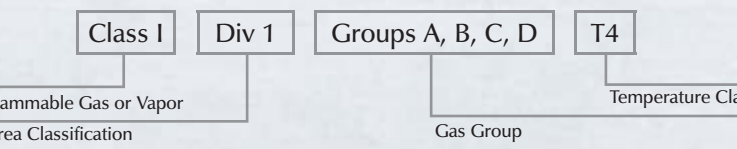
D9T-RS485IS D9T-EX 455-\*M Cable



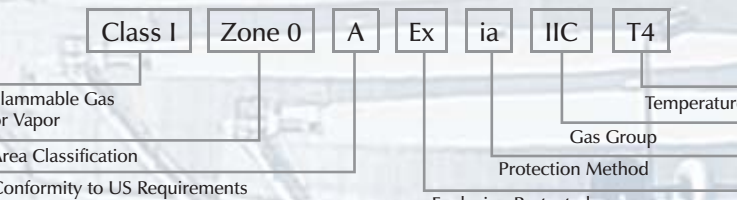
Hazardous Area Descriptions

Class and Groups			
Class	Substance	Group	
		NEC500	NEC505/CENELEC/IEC
Class I (gas)	Acetylene	A	IIC
	Hydrogen	B	
	Ethylene	C	
	Propane	D	
Mining	Methane		I
Class II (dust)	Metal dust	E	Note: See Zones Below
	Coal dust	F	
	Grain dust	G	
Class III (fibers)	Fibers		
Division / Zone			
Flammable Material	NEC500	NEC505	CENELEC/IEC
Continuously Present	Division 1	Zone 0	Zone 0 (Zone 20-dust)
Likely to / Can be Present		Zone 1	Zone 1 (Zone 21-dust)
Not Normally Present	Division 2	Zone 2	Zone 2 (Zone 22-dust)
Temperature			
Maximum Surface Temperature °C	Temperature Class		
	NEC500	NEC505/CENELEC/IEC	
450	T1	T1	
300	T2		
280	T2A		
260	T2B		
230	T2C		
215	T2D	T2	
200	T3		
180	T3A		
165	T3B		
160	T3C	T3	
135	T4		
120	T4A		
100	T5	T4	
85	T6		
		T5	
		T6	

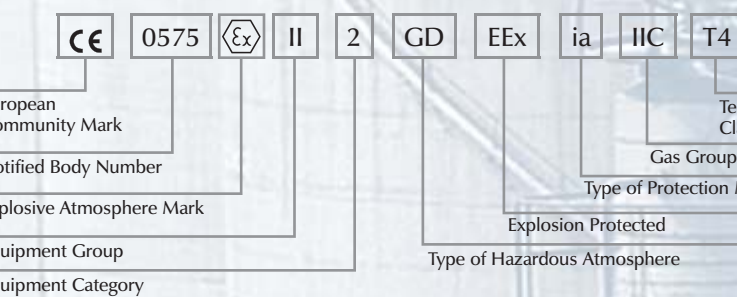
NEC500 (Division Method)



NEC505 (Zone Method)



ATEX



SOLENOID DRIVERS

The NEC (national electrical code) defines an Intrinsically Safe Circuit as: A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed conditions. (NEC 504-2)

**Simple Apparatus:**

An electrical component or combination of components of simple construction with well-defined electrical parameters that does not generate more than 1.5 volts, 100 milliamps, and 25 milliwatts, or a passive component that does not dissipate more than 1.3 watts and is compatible with the intrinsic safety of the circuit in which it is used.

ANALOG INPUT / OUTPUT

SWITCHING AMPLIFIERS

	IM31-11Ex-i	IM31-12Ex-i	IM31-22Ex-U IM31-22Ex-i	IM33-11Ex-Hi/24VDC	IM33-12Ex-Hi/24VDC	IM33-22Ex-Hi/24VDC	IM33-11Ex-Hi	IM33-12Ex-Hi	IM33-22Ex-Hi	IM33-FSD-Ex/L	IM34-11Ex-i IM34-11Ex-Ci	IM34-12Ex-Ri	IM34-12Ex-CRi	IM34-14Ex-CDRi	IM35-11Ex-Hi/24VDC	IM35-22Ex-Hi/24VDC	MK33-11Ex0-PLi/24 VDC	MK35-11Ex0-Li/24 VDC
Voltage Supply	20-250 VAC 20-125 VDC	20-250 VAC 20-125 VDC	20-250 VAC 20-125 VDC	24 VDC	24 VDC	24 VDC	20-250 VAC 20-125 VDC	20-250 VAC 20-125 VDC	20-250 VAC 20-125 VDC	without auxiliary energy	20-250 VAC 20-125 VDC	20-250 VAC 20-125 VDC	20-250 VAC 20-125 VDC	20-250 VAC 20-125 VDC	24 VDC	10-30 VDC	10-30 VDC	10-30 VDC
Inputs	0/2-10 V 0/4-20 mA	0/2-10 V 0/4-20 mA	2 x 0/2-10 V 2 x 0/4-20 mA	0/4-20 mA	1 x 0/4-20 mA	2 x 0/4-20 mA	1 x 0/4-20 mA	1 x 0/4-20 mA	2 x 0/4-20 mA	2 x 0-20 mA	Ni/Pt100 or thermo-elements or mV-input	Ni/Pt100 or thermo-elements or mV-input	Ni/Pt100 or thermo-elements or mV-input - FDT/DTM	Ni/Pt100 or thermo-elements or mV-input - FDT/DTM	0/4-20 mA	2 x 0/4-20 mA	1 x 0/4-20 mA	1 x 0/4-20 mA
Outputs	0/4-20 mA	2 x 0/4-20 mA	2 x 0/4-20 mA 2 x 0/2-10 V	0/4-20 mA	2 x 0/4-20 mA	2 x 0/4-20 mA	1 x 0/4-20 mA	2 x 0/4-20 mA	2 x 0/4-20 mA	2 x 0-20 mA	1 x 0/4-20 mA	1 x 0/4-20 mA 1 relay (N.O.)	1 x 0/4-20 mA 1 relay (N.O.)	3 relays (N.O.) 1 x 0/4-20 mA	0/4-20 mA	2 x 0/4-20 mA	1 x 0/4-20 mA	1 x 0/4-20 mA
Approvals	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX	IECEX ATEX	IECEX ATEX	IECEX ATEX	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL	ATEX FM, CSA	ATEX FM, CSA

	IM72-11Ex/L	IM72-22Ex/L
Voltage Supply	19-30 VDC	19-30 VDC
Inputs	15-24 VDC	15-24 VDC
Outputs	45 mA	65 mA
Approvals	IECEX ATEX, FM C/US, UL	IECEX ATEX, FM C/US, UL

ROTATIONAL SPEED MONITORS

	MK21-12Ex0-R/-	MK21-12Ex0-RI/-	IM21-14Ex-CDRi
Voltage Supply	24 VDC / 115 VAC / 230 VAC	24 VDC / 115 VAC / 230 VAC	20-250 VAC / 20-125 VDC
Input/Output	Overspeed and underspeed monitor, 1 intrinsically safe NAMUR input, 2 SPDT relay outputs	Overspeed and underspeed monitor, 1 intrinsically safe NAMUR input, 1 SPDT relay and 1 analog output	Overspeed and underspeed monitor, 1 intrinsically safe NAMUR input, relay and analog outputs
Approvals	ATEX, FM, CSA	ATEX, FM, CSA	ATEX

SET POINT MODULES

	IM43-13-R	IM43-13-SR	IM43-14-SRi	IM43-14-Ri
Voltage Supply	20-250 VUC	20-250 VUC	20-250 VUC	20-250 VUC
Inputs	0/4-20 mA or 0/2-10 V or transmitter	0/4-20 mA or 0/2-10 V or transmitter	0/2-10 V or transmitter	0/4-20 mA or 0/2-10 V or transmitter
Outputs	3 relays (N.O.)	3 relays (N.O.)	3 relays (N.O.) 1 x 0/4-20 mA	3 relays (N.O.) 1 x 0/4-20 mA

RELAY & POWER SUPPLIES

	IM82-2414/94-265VAC	IM82-2450	IM73-12-R/24VUC
Voltage Supply	Power supply	Power supply	Relay coupler
Voltage Output	85-265 VAC 210-375 VDC	94-265 VAC	24 VDC
Approvals	-	-	UL, CSA



The MBD49-T415/Ex is designed to connect a large number of field devices to the FOUNDATION fieldbus, including hazardous areas.



Dedicated FOUNDATION fieldbus display.



Power conditioners are available in several different styles. These can be used for multiple applications, including asset management, repeaters and for the control of devices in various hazardous environments.



INTRINSICALLY SAFE REMOTE I/O SYSTEM



System Overview

excom® may also be used in potentially explosive hazardous locations. It provides bus-compatible, decentralized input and output modules for connection of discrete and analog intrinsically safe field devices. excom is FDT/DTM and HART compatible, and may be used in Division 2, zones 1 and 2. The field circuits are approved for use in Division 1, zone 0.

Part Number	Type of Device	Device Features			
		Type of Input	Type of Output	Number of Inputs	Number of Outputs
GDP1.5	gateway	-	-	-	-
SC12Ex	coupler	RS485	discrete	1.5	1
DM80Ex	I/O module	NAMUR	discrete	8	8
DF20Ex	I/O module	multi	multi	8	4
AH40Ex	I module	analog	-	4	-
AIH41Ex	I module	analog	-	4	-
TI40Ex	I module	analog	-	4	-
DO40Ex	O module	-	discrete	-	4
AO40Ex	O module	-	analog	-	4
OC11Ex/2G/3G	coupler	RS485	optical	1	2
MT18/MT9	backplane	-	-	-	-
Modex Filter	filter	-	-	-	-
PSD24Ex	supply	-	-	-	-



The SC12Ex segment coupler is used in conjunction with the system, and can also be mounted in Div 2, zones 1 and 2.



FOUNDATION™ fieldbus

FOUNDATION™ fieldbus is a networked serial bus system designed to replace the standard 4 to 20 mA control system in the process industry. The transmission technology for the system was defined in 1994 with the publication of the international standard IEC 61158-2 (later integrated into the European standards as EN 61158-2). This same standard serves as the transmission technology for both FOUNDATION fieldbus and PROFIBUS®-PA, although the logical implementation of these two networks is significantly different. One of the key benefits of FOUNDATION fieldbus, as with network systems in general, is the dramatic reduction in wiring. The FOUNDATION fieldbus H1 system carries data and power for all devices on a single pair of wires, as opposed to the traditional need for a separate wire pair for each device.

Part Number	Type of Device	Device Features		
		Type of Output	Number of Inputs	Number of Outputs
DPC-49-MB-RC	backplane	-	-	-
DPC-49-ADU	diagnostic unit	-	-	-
DPC-49-IPS	power conditioner	-	-	-
DPC-49-BM-DPC	blank module	-	-	-
DPC-49-HSEFD/24VDC	HSE diagnostic	HSE	-	-
RPC49-10...EX	conditioner	FISCO	-	-
MBD49-M413/FM	multibarrier	FISCO	-	4
MBD49-T415/Ex	multibarrier	FISCO	-	4
MBD49-T416/Ex	multibarrier	FISCO	-	4
FD49-T317/Ex	field display	visual	-	-