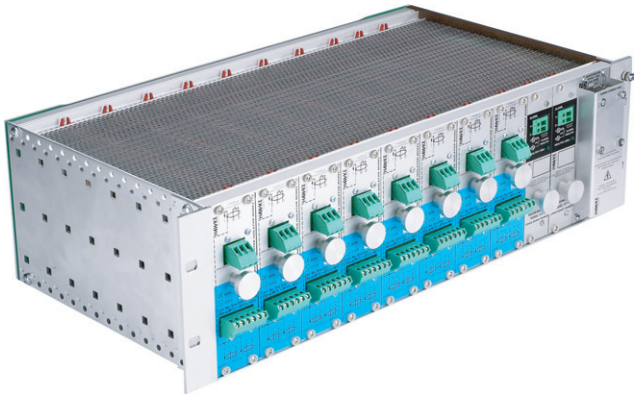
MOORE HAWKE
FIELDBUS WORLDWIDE

ROUTE-MASTER™ Series 100 Fieldbus System

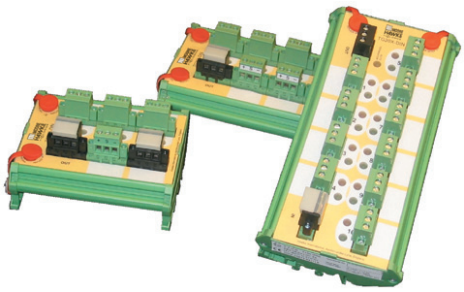
Intrinsically-safe fieldbus segment power supplies and electronic device couplers

September 2005

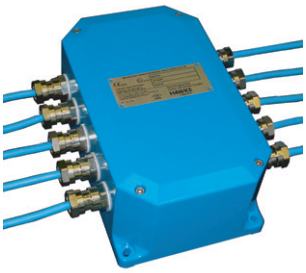


Isolated & redundant I.S. segment power without FISCO restrictions!

FOUNDATION
Foundation Tested FF-831-1



TG100 electronic device couplers



Field Enclosures; available in aluminium, GRP or stainless steel

FM APPROVED

The ROUTE-MASTER™ Series 100 Fieldbus system sets new standards in powering intrinsically-safe fieldbus devices. ROUTE-MASTER™ is the first intrinsically-safe fieldbus system to take practical field wiring issues into account, rather than simply concentrating on designing new barriers. The RM100 Rack has dual redundant power supplies and is capable of supporting up to 8 Trunk Isolator Modules, each of which can provide up to 350mA for fieldbus devices. Field device connections are made through MooreHawke TG100 Series Device Couplers, which provide the complete solution to fieldbus wiring issues. MooreHawke Device Couplers incorporate all necessary terminals, provide short-circuit protection per spur and include built-in terminators. Standard Device Couplers are normally specified with Hawke cable glands for armoured, unarmoured or offshore cable, with a wide variety of alternatives on request.

The MooreHawke system delivers high segment capacity, with excellent reliability and the highest system availability. Each base rack incorporates a primary AC transformer with 8 secondaries, each secondary driving one channel of a linear DC voltage regulator to feed an individual Trunk Isolator Module. When specified for redundant applications, that entire power supply system is duplicated (another AC transformer set plus another 8 channels of DC Regulators) to achieve the very highest systems performance. The DC Regulator Cards have output monitoring and common alarm on any individual channel failure, with full load-sharing capabilities, and also permit 'hot swapping' without any service interruption.

Using a patented split-architecture design rather than FISCO, the MooreHawke RM100 Series delivers the highest segment current (350mA) of ANY intrinsically-safe system for the largest number of devices and/or the longest segment cable, with cable lengths of up to 1900m trunk and 120m spurs. (FISCO designs only increase the capability of conventional solutions from around 80mA to around 110mA for IIC (Group A B) and to around 250mA in IIB (Group C), but also come with significant operational restrictions: allowable segment is reduced from 1900m to 1000m, allowable spur length is reduced from 120m to 30m, and there is a significant reduction in overall reliability and MTBF through the necessarily complex current-limiting electronics required by FISCO power supply design.)

TG100 Series Device Couplers are required with the complete I.S. system. TRUNKGUARD™ technology provides electronic short-circuit protection per spur which is designed to switch off faulty spurs, preventing loading problems (other systems simply have current-limiting circuits which maintains each and every fault as a continuous load on the segment). The TG100 units also have unique automatic segment termination, eliminating the primary cause of commissioning errors in fieldbus systems

Overall, the RM100 Series system simplifies cable parameter analysis: Profibus PA & FF816 devices have standardized Entity Parameters, and any normal Type 'A' cable (i.e twisted pair shielded cable, size AWG18/0.75mm^2, with L/R<30μH/Ω and capacitance < 200nF/km) will be safe for trunks up to 1900m and spurs up to 120m in any gas hazard. Adding further devices to an existing RM100 I.S. system is therefore very straightforward and will be covered by the original safety assessment. The RM100 system is as easy to use as FISCO but without the FISCO restrictions.

FEATURES

Isolated power supplies for I.S. fieldbus applications (FOUNDATION Fieldbus™ or PROFIBUS PA).

Highest capacity / longest cables of any IS-certified fieldbus system - *350mA/segment*

Highest reliability & system availability via
- *passive conditioning*
- *simple linear design*
- *dual redundant DC power supply*

Easy installation & commissioning with MooreHawke Device Couplers, complete with all of the necessary accessories

New - *TG100R for for IIB / Group CD locations*
- *TG100E for IIC / Group ABCD locations*

Fieldbus FOUNDATION tested & registered

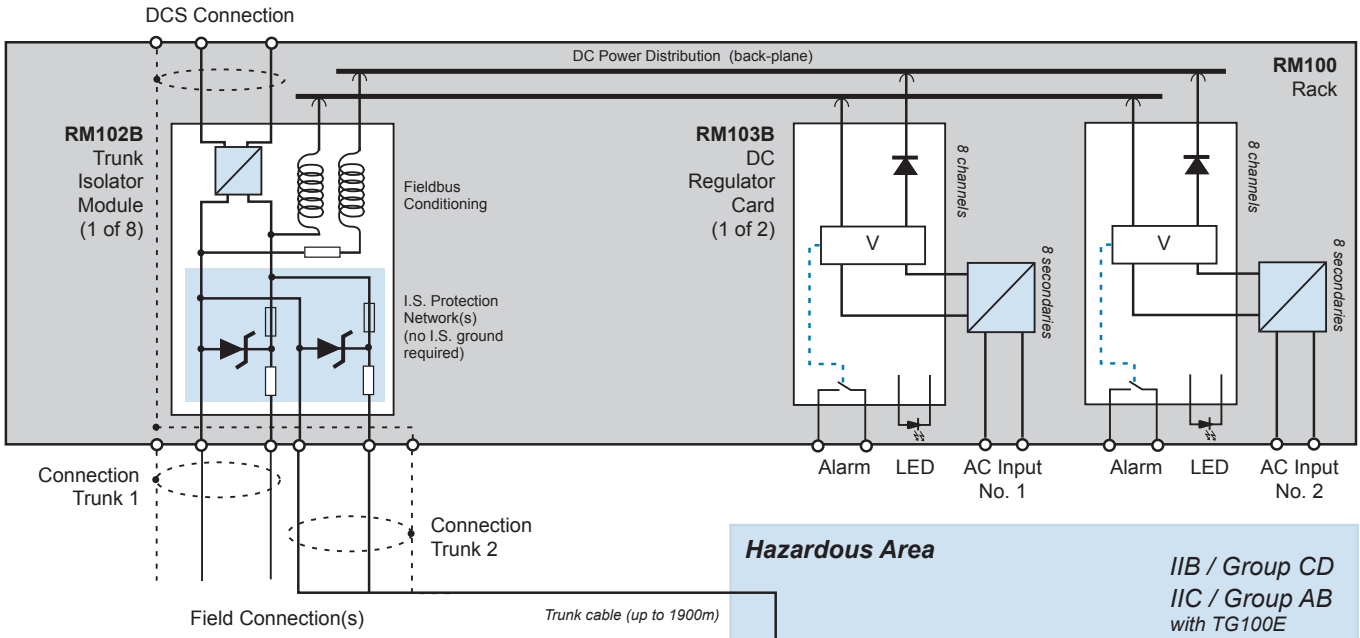
TYPICAL HOOK-UP & APPLICATION

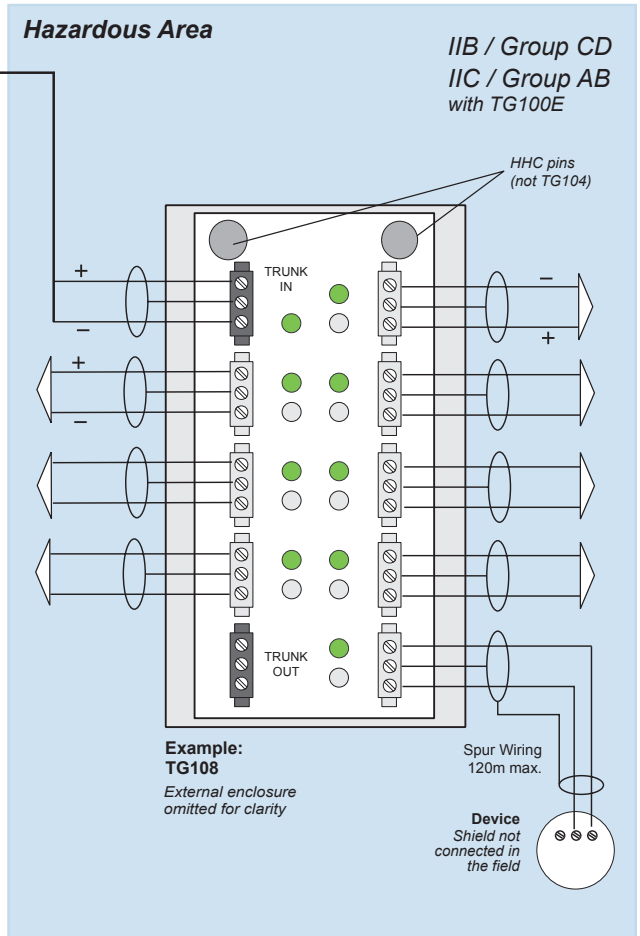
Wiring the RM100 Series system is very simple: the H1 segment from the DCS I/O card is wired directly to the Trunk Isolator Module upper (uncertified) terminals and the field trunk connection is available via the lower (certified) terminals. **No** I.S earth or ground is required. Fieldbus-compatible twisted-pair cable is recommended for wiring to one (or more) TG100 Series Device Couplers. These provide connection points for fieldbus devices via individual spurs. The cable shields (shown dashed) are simply carried through the isolator card for termination within the panel at a 'clean' earth/ground point.

The RM100 Series Rack houses an AC power transformer (isolated to I.S. standards) with 8 independent secondaries, each wired to an independent channel on the DC Regulator Card. When specified for redundancy, the AC transformer **and** DC Regulator Card are completely duplicated, with each set capable of independently supporting the full rack load, and hot-swappable in service without communications interruption.

Normal operation is indicated by front-mounted LEDs and volt-free contact closures are available to alarm any failure. Replacement of any redundant card under power will not cause any service interruption.

Uniquely, RM102B Trunk Isolator Modules provide **dual trunk** outputs. These are the same fieldbus segment (in that they share the same total 350mA power budget and H1 connection), but are separate intrinsically-safe circuits and so can be wired completely independently. Sharing the total current between two pairs of cables makes even more voltage available to field devices. Note: Each segment needs two terminators, which may automatically be provided by the last Device Coupler per trunk in dual-trunk mode, or one Device Coupler and one local terminator (TRK-TERM) in single trunk mode.





MooreHawke TG100 Series Device Couplers provide the ideal solution for fieldbus device connections. IP66 / NEMA 4X enclosures means they can be located conveniently on the plant, eliminating maintenance access concerns, and allowing fast and easy wiring. Various materials are available to suit all process environments (standard units are GRP glass-reinforced polyester, 316 stainless steel and cast aluminium are also available). Device Couplers include all necessary accessories for immediate implementation of fieldbus systems - pluggable terminals, automatic segment terminator, LED status indicators per spur (GREEN shows spur is healthy, RED shows spur is in short-circuit mode). Unused gland entries are fully sealed and no further weatherproofing is necessary for unused entries. Alternatively, TG100 units may be supplied without glands or enclosure, suitable for DIN-rail mounting in custom assemblies (by others).

Spur short-circuit protection for TG Series Device Couplers is via electronic auto-resetting short-circuit protection technology. TRUNKGUARD™ is a unique design that eliminates faulty loads from segments and automatically resets back to normal as soon as the wiring or device fault is cleared.

TG100R Series Device Couplers are suitable for installation in IIB or Group CD gas hazards, with TG100E Device Couplers for installation in IIC / Group ABCD gas hazards. The TG100E incorporates alternative non-pluggable terminals for trunk in/out and the trunk is wired in Exe or similar non-intrinsically safe cable. Any I.S. approved field device can be used compatible with either FF816 entity levels or FISCO approvals; both are acceptable for use with TG100 Series.

SPECIFICATIONS

RM100 Series Rack

Capacity	Up to 8 off RM102B Trunk Isolator Modules Up to 2 off RM103B DC Regulator Cards
Output per segment	18.2Vdc, 350mA (guaranteed minimum), 23Ω nominal source impedance
Supply Voltage	230V or 115V ac, 50/60Hz
Indicator	DC Regulator Card Green LED (ON when OK)
Alarm	Relay, volt-free contact closure, open on alarm, rated 240Vac / 0.5A / 100VA
Power Loading	35W per fully loaded rack
Fault Power Loading	250W with all isolators installed and in short-circuit
MTBF (Calculated to MIL-HDBK-217F)	475 years Rack c/w 1 DC Regulator Card 5188 years Rack c/w 2 DC Regulator Cards 1248 years RM102B Trunk Isolator Module
Environmental limits	(Operation) -20 to +60°C, 0-95% RH non-condensing (Storage) -40 to +80°C, 0-95% RH non-condensing
Terminals	Cage-clamp type, max. 4mm² (12-24AWG)
Weight	<14Kg fully loaded
EMC Compliance	To generic immunity standards EN50 082-2, Parts 1& 2 for industrial environments
LVD Compliance	EN60 950, EN61 010-1

TG100 Series Device Couplers

Capacity	4-, 8- or 10-fieldbus devices, plus TRUNK IN / TRUNK OUT
Short-circuit protection	Electronic, auto-resetting, 48mA max. let-through
Housing	Cast Aluminium, painted (TG114/TG118) Glass-reinforced Polyester (TG134/TG138) Stainless Steel (TG124/TG128/TG148/TG14X/TG14Y)
Protection	IP66 to EN60529, NEMA 4X
Environmental limits	(Operation) -45 to +70°C, 0-95% RH non-condensing (Storage) -50 to +80°C, 0-95% RH non-condensing
Terminals	Pluggable cage-clamp type, 0.8 to 4mm² (12-24AWG)
Terminator	Automatic selection at end of line Nominal 100 Ohms/1μF

Segment Availability (redundant system) 99.99993%

SEGMENT CAPACITY *(example)*

Source description: 18.5V, 23R
Spur impedance: 1.2V, 55R

Segment calculation
(Assuming n devices, each taking i, total current draw n.i and cable resistance Rc

Voltage at device coupler = 18.5 - (n.i.23) - (n.i.Rc) = 9.5V minimum

i.e $Rc = \frac{9 - (n.i.23)}{n.i}$

Example 1:
10 off 15mA devices,
Rc = 37R (=820m for 45R/km/loop cable)

Example 2:
12 off 20mA devices
Wired as dual trunk, split 6 + 6
Rc per trunk = 52R (=1150m for 45R/km/loop cable)
In practice, each trunk is restricted to 950m max. in order to stay within 1900m overall limit (set by FF).

CERTIFICATION Sira and FM approvals shown, others available - contact MooreHawke

Sira* 00ATEX2090X to Cenelec EN50 014/020

RM100 Series Rack)
II (1) GD [EEx ia] IIB
Ta = -20 to +60°C

TG100R Series Device Couplers
II 1 GD EEx ia IIB T4
Ta = -45 to +70°C
EEx [ia] IIC
(Field device connections)

TG100E
II 2(1) GD EEx me[ia] IIC T4
Ta = -40 to +70°C

FM* to NEC (ANSI/NFPA 70) Art. 504 & 505

FM APPROVED

System of non-hazardous location mounting power supply (Rack) for connection to intrinsically-safe device coupler Cl I, Div. 1 Grps C,D (TG100R) or Cl I Div2 Grps A,B,C,D (TG100E), either with field connections Class I, Div1, Groups A,B,C,D

* approval pending

Spur Connection Entity Parameters

Uo (Voc)	=	18.9V
Io (Isc)	=	249.3mA
Po (Pmax)	=	1.15W
Ci / Li	=	0

Note: Hawke Device Couplers are compatible with standard fieldbus device Enity Parameters ($V_{in:max}$ = 24V, $I_{in:max}$ = 250mA, $P_{in:max}$ = 1.2W). and FISCO-model devices with parameters $V_{in:max}$ < 17.5V, $I_{in:max}$ = 380mA, $P_{in:max}$ = 5.32W

Entity Parameters for RM100 System

Gas Group	**Capacitance** (nF)	***AND***	**Inductance** (mH)	***OR***	**L/R ratio** (μH/Ω)	
IIA/Group D	6390 (Trunk or Spur)		0.412 (Trunk plus Spurs)		72	*The maximum system limits are Ca capacitance AND either La inductance OR cables with L/R ratios less than those shown.*
IIB/Group C	1600 (Trunk or Spur)		0.206 (Trunk plus Spurs)		36	
IIC/Group A B	262 (Spur only)		0.150 (Trunk plus Spurs)		30	

Typical Type A (screened twisted pair) cable data

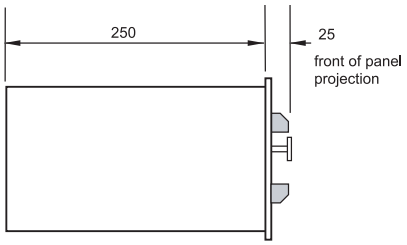
Type	**Capacitance** (nF/km)	**Inductance** (mH/km)	**Resistance** (Ω/km/core)	**L/R Ratio**	**Notes**
Turck/BT Interlink 490/493	100	0.48	21.4	22.4	18AWG, non-armoured
Turck/BT Interlink 492	100	0.62	24.1	25.7	18AWG, armoured
Belden 3076F	78	0.617	23.7	26	18AWG, non-armoured
Belden 3077F	143	0.65	55.6	12	22AWG, non-armoured
Kerpen 727900019	115	0.66	26.5	25	0.75mm², non-armoured
Kerpen 7279B0015	115	0.46	18.4	25	1.0mm², non-armoured

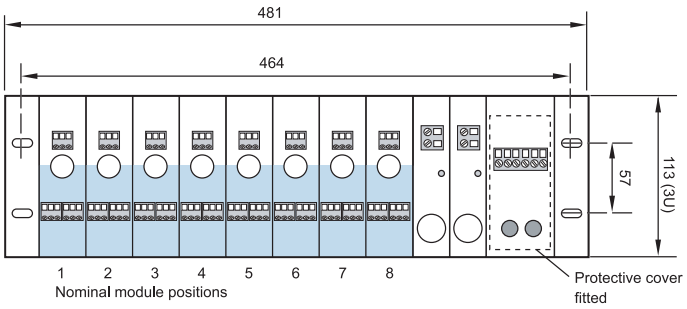
Standard FF/PA devices have Entity Parameters which should not exceed 20μH and 10nF. Therefore, even 1900m (trunk) and 120m (spurs) would be compatible with any of the cables listed above. Note that each trunk in a dual trunk pair is an independent circuit as far as I.S. is concerned.

Contact MooreHawke for advice on the safe use of larger cables (usually have higher inductance) or with non-standard devices

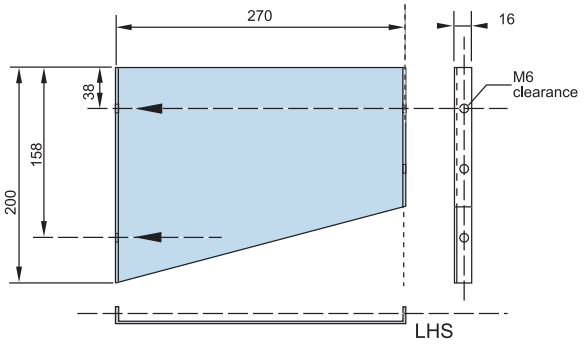
DIMENSIONS (mm)

RM100 Rack

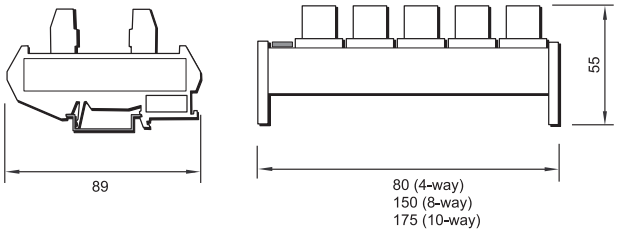




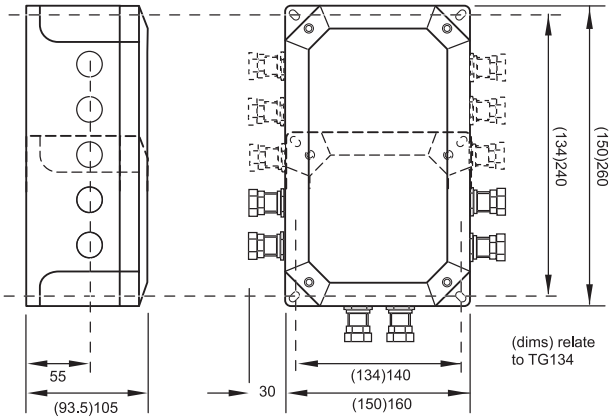
RMB-001



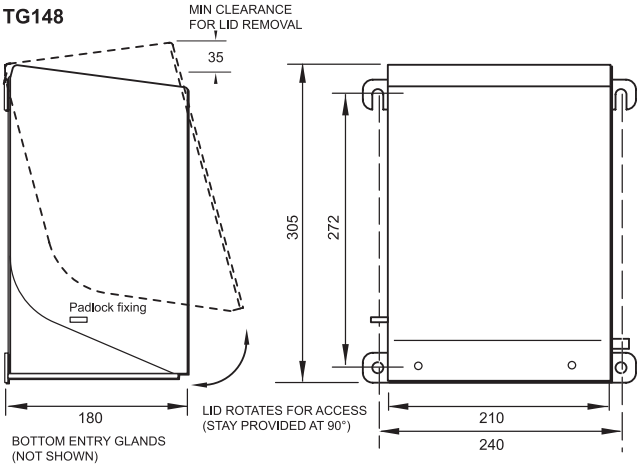
TG100-DIN



TG118/128/138 (114/124/134)



TG148



TO ORDER, *please specify the following complete codes*

RM100 -	**Rack**
1 to 8	Trunk Isolator Modules fitted (unused spaces blanked off)
- 1	Single DC Regulator card
- 2	Redundant DC Regulator cards
- A	115V ac input
- B	230V ac input

Example **RM100-6-2-B**

TG100	**Device Coupler I.S.**
TG11*	Aluminium enclosure
TG12*	316 Stainless Steel enclosure (standard box type)
TG13*	GRP enclosure
TG14*	316 Stainless Steel enclosure (E-Z LID)
4	4-spurs
8	8-spurs
X	10-spurs
- A	421 glands for unarmoured cable
- B	453 glands for armoured cable, offshore
- C	153 glands for armoured cable
- D	IP66 hoseproof stopping plugs

Nominal Cable outer sheath diam. (mm)

	Type 421	*Type 153/453*
- S	3.0 to 8.0	5.5 to 12.0
- O	7.5 to 11.9	9.5 to 16.0

Example **TG138-A-O**

TG104-DIN	**Device Coupler, 4-way, DIN-rail mounting w/o enclosure**
TG108-DIN	**Device Coupler, 8-way, DIN-rail mounting w/o enclosure**
TG10X-DIN	**Device Coupler, 10-way, DIN-rail mounting w/o enclosure**

ACCESSORIES

RMB-001	**Rack Mounting Bracket**
TRK-TERM	**Trunk Terminator (for use on RM102B only)**

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