THREE CHANNEL AC EARTH FAULT GUARD

KCM363x

- **For grounded or non-grounded live networks in land, marine and sub-sea installations**
- **True r.m.s. Measurement not affected by heavily distorted waveforms**
- **3 Individual channels**
- **Non-resitive earth current offset function**
- **Restricted or Unrestricted earth fault detection**
- **Pathfinder function identifies channel trip**
- **Up to two individual very fast analogue output signals (<50mS), (optional)**
- **DIN96 Slave Indicator with full current scale (optional)**

Specifications

Standard Auxiliary Voltage:	100-120V, 200-240V, 380-415V, 440-460V, 480VAC, 40-70Hz (Fuse 0,5A)
Optional Auxiliary Voltage:	24-60VDC (Fuse 0,5A) 110-220VDC (Fuse 1A)
Supply tolerance:	+10%, -20%
Power rating:	5VA
Contact rating:	AC: 100VA -250V/2A max. DC: 50W -100V/1A max.
Scale range:	0-150mA as standard (Other range on request)
Adjustments:	See page 4
Ampere range:	Any % of the CT value
Analogue output 1: (see page 5 for available outputs)	mA: Up to 20mA, max 500R V: Up to 10V, min 100kohm (other on request)
Analogue output 2: (see page 5 for available outputs)	mA: Up to 20mA, max 500R V: Up to 10V, min 500ohm (other on request)
Accuracy:	Class 0,5
Temperature:	-20 to +70ºC
Humidity, relative:	0-95%
Weight:	0.6kgs
Front protection:	IP21
Flammability:	UL94-V0

The unit meets EN 60255-27 Cat. III, Pollution degree 2 and the relevant environmental and EMC tests specified in EN 60255-26 to comply with the requirements of the major Classification Societies.

Related information:
The KCM363x series are also available for panel mounting as KPM363x series.

Description

The three channel digitally controlled KCM363x monitors up to three earth current channels in a non-grounded (IT) or grounded TN network and its protective earth. Unit can be used for either Restricted or Unrestricted earth fault detection. There is individual relay for alarm or trip of load breaker.

The unit reads the level of earth leakage directly in mA. The standard range is 0-150mA. Larger scale values are available, typically 500mA, 1A, 2A, 5A and 10A. The 3-channel KCM363x automatically locks the meter to read the **highest** of the three channels.

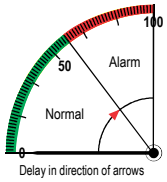
An AC or DC auxiliary voltage is required for the unit. Start of monitoring function is inhibited when auxiliary power is switched on (default 2secs delay). In this way false tripping during power up.

The meter status LEDs give at a glance the clear safety message:

LED status		
Power		Alarm
●		●
Normal		Alarm

ALARM (red zone)

HEALTHY (green zone)



Delay in direction of arrows

General

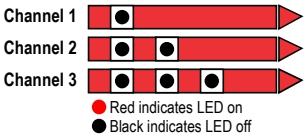
RCD MEASURING PRINCIPLE
Earth current is measured by a IG-transformers CBCT (Core Balance Current Transformer). The measuring technique is based on the principle that the sum of the phase currents in a fault free circuit is zero. If an earth fault present, the sum of the phase currents is not zero. This current differential produces a signal from the IG transformer, which is proportional to the earth current. All loaded wires shall go through the CBCT.

OUTPUTS
Up to two individual very fast analogue output signals (optional) proportional to meter reading. If output is used for remote meter reading, we recommend 0-1mA for the slave indicator.

The unit has C/O relay outputs for Alarm/trip. All relays are fail to safety configured. A trip LED flashes when the trip level is passed, the relay trips when the delay has elapsed. The timer resets if the fault is removed during countdown. Offset, trip levels and delay are settable on unit front. The trip delay is common for all 3 channels.

OFFSET FUNCTION
Only the resistive (ohmic) earth leakage current is a measure for the insulation condition between the AC supply and its protective earth. Any reading of leakage current in a fault free network will be caused by the networks spread capacitance. An offset potentiometer on the rear allows normal reactive (capacitive) currents to be ignored.

PATHFINDER FUNCTION
The flashing pattern of the Alarm LEDs on the **KCM363Gx** identifies the channel producing the trip.



KCM363x

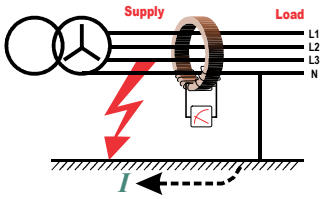
General

The difference between restricted and unrestricted earth fault protection is the location of the neutral grounding point. When combined with a suitably rated CBCT the KCM363x can be used in either application. The different TN-nets are described below:

Restricted Earth Fault Detection

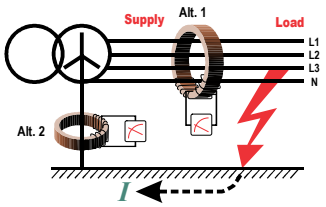
The neutral grounding is on the LOAD side of the CBCT. Any leakage to earth on the SUPPLY side of the CBCT will be seen as an imbalance situation, and will cause the Earth Leakage Guard to trip if leakage current exceeds the trip level settings. Faults on the LOAD side of the CBCT are not detected.

This method is commonly used to protect generators, with trip level typically set at approximately 10% of machine output rating.



Unrestricted Earth Fault Detection

The neutral grounding point is on the SUPPLY side of the Core Balanced Current Transformer (CBCT). Any leakage to earth on the LOAD side of the CBCT will be seen as an imbalance situation, and will cause the Earth Leakage Guard to trip if leakage current exceeds the trip level settings. Faults on the SUPPLY side of the CBCT are not detected. This method is used for general protection.



PROTECTIVE EARTH (PE) GROUNDING
In grounded supply systems earth current measuring method must be selected on the principle of grounding used; i.e. distributed or centralised PE-grounding.

A distributed system may have multiple PE-connections, and consequently all loaded wires must be CBCT monitored, shown as **alternative 1**. In a centralised system the CBCT monitors the resultant earth current flow through the one and only PE grounding link from a generator, a transformer or a section of a switchboard, shown as **alternative 2**. This method is not recommended for parallelled generators sharing a common load.

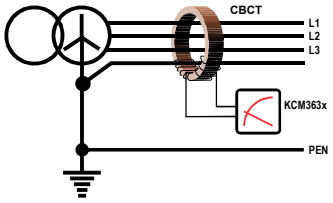
TN-S Network

In a TN-S Network the PE and Neutral are separated all the way from the supply side. PE and N **must** not be connected together at any point after the distribution point.

L1, L2, L3 and N feed in a 4-wire cable to the consumer and PE is separate.

Either all loaded wired or just the non-loaded main ground shall be feed through the CBCT.

PE form thus a continuos ground electrode.

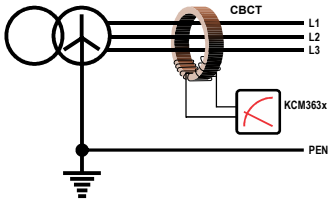


TN-C Network

In a TN-C Network the PE-wire acts as a combined earth and Neutral wire. It is described as a "PEN-conductor" (Protective Earth Neutral). In this net there is limited human protection against the earth fault. A rarely used system.

To overcome this you can split the PEN wire into two parts, one wire will be the Neutral and the other the PE wire (TN-C-S Network).

Either all loaded wired or just the non-loaded main ground shall be feed through the CBCT.

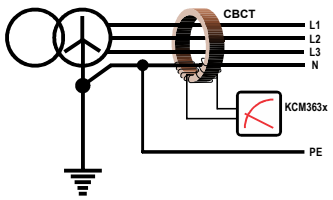


TN-C-S Network

TN-C-S Network is almost identical in structure to the TN-C, except that in the TN-C-S the PEN conductor is split at the distribution point to a N-wire and a PE wire.

Also known as Protective Multiple Earthing (PME) or as Multiple Earthed Neutral (MEN).

Either all loaded wired or just the non-loaded main ground shall be feed through the CBCT.



KCM363x

KCM363x in an IT or TT Network

TT Network

In a TT Network the Neutral point is grounded at the transformer but the ground connection is not wired to the consumer. The consumer is grounded locally. On an earth fault the earth current will depend on the resistance (R) of the return path to the transformer.

There can be a long distance between the transformer ground and the local ground, an earth current **can** be high.

An earth current will **normally** be detected by a CBCT but it is recommended to install a constant impedance module (MML15xx) for the return path to secure uniform detection of an earth fault.

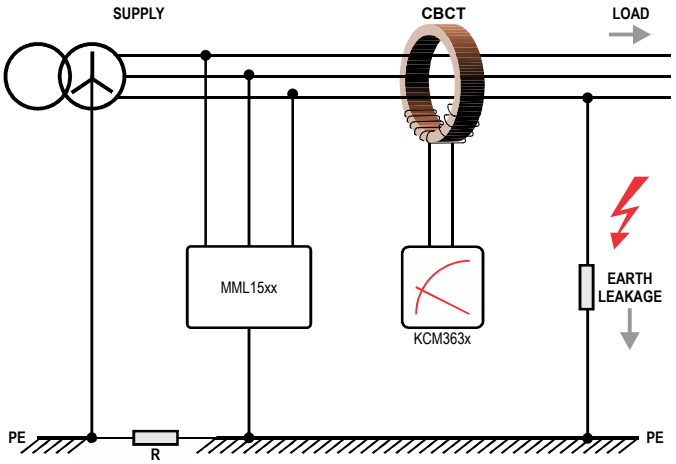
IT Network

In an IT Network the distribution system has no connection to earth or it has a high impedance connection. The preference for these systems is to use an insulation monitoring unit like KCM16x. However the use of a constant impedance module (MML15xx) gives the possibility to provide individual earth fault monitoring of each consumer.

The MML provides a normalised return path for earth current detection. This principle will only work in networks with small spread capacitance.

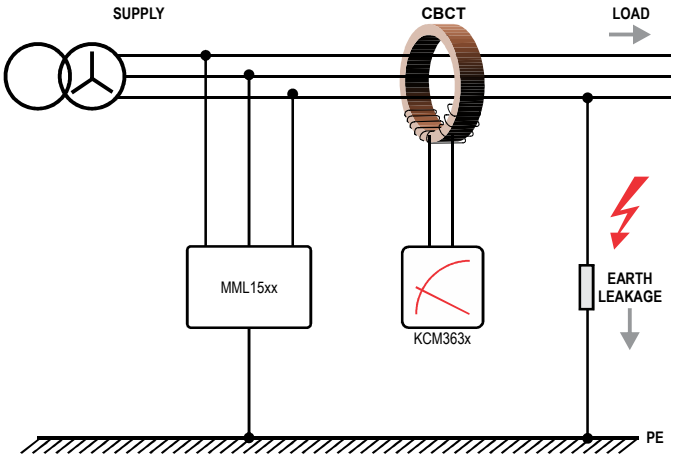
IT networks are preferred on vessels, offshore and hospital to provide the highest possible personnel safety.

TT Network



Principle drawing for 3-wire three phase system

IT Network



Principle drawing for 3-wire three phase system

Impedance module

Models	MML1502C : 100-240VAC MML1503C : 380-460VAC MML1506C : 480-690VAC MML15010C : 1000VAC
Weight:	Up to 460V: 0.3kgs Over 460V: 0.5kgs

MML15xx

MML15xx provides a normalised earth fault leakage current return path in TT and IT-networks.

The DIN-rail mounted MML15xx is used in non-grounded (isolated) AC supply systems, where loads/ branches are to be selectively earth fault-monitored. By providing a normalised earth fault leakage current return path, MML15xx improves accuracy and sensitivity of a earth fault monitoring system.

MML15xx is connected from each line voltage (R/S/T) to protective earth (PE). Current load is depending of harmonic frequencies.

NB! MML15xx must be inserted on the supply side of the residual current transformer (T1).

More than 3 channel monitoring?

ISOPAK100 series

Megacon recommends ISOPAK100 series - Universal AC Earth Fault Protection System

The digitally controlled ISOPAK100 adds to Megacon's wide range of ISOGUARD products for insulation and earth fault monitoring and protection. Up to 24 channel earth leakage monitoring of **LIVE AC** networks.

Highest up function gives peace-of-mind

The purpose of ISOPAK100 is to selectively detect and address earth faults in live 50 or 60Hz networks. An intelligent highest up function highlights the highest level of hazard in the system, and only alerts the operator when conditions for an impending danger are present.

KCM363x

Models

Models	Channel	Latch	O/P 1	O/P 2	Pathfinder
KCM363E	3	-	-	-	-
KCM363FA	3	-	X	-	-
KCM363FB	3	-	X	X	-
KCM363G	3	X	-	-	-
KCM162GFA	3	X	X	-	-
KCM363GFB	3	X	X	X	-

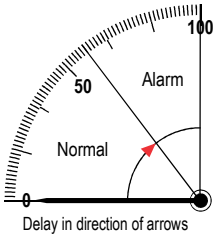
Relay Configurations

Relay	Ch.1	Ch.2	Ch.3	Fail Safe	Latch
R1	X			X	*X
R2		X		X	*X
R3			X	X	*X

Relays shown de-energised.
R1, R2 & R3 are fail-safe and energises when unit is powered.
*X) See the table to the left for models with latch function

Adjustments	Trip level	Delay*
Alarm Ch. 1:	0-100% FSD	0-30secs
Alarm Ch. 2:	0-100% FSD	0-30secs
Alarm Ch. 3:	0-100% FSD	0-30secs

Offset: Min - Max
***Delay:** Common for all channels



Delay in direction of arrows

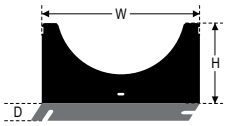
Typical IG-Transformers for KCM363x series

IGTx & IGRx series are used as sensor to detect earth leakage current in Megacon Earth Fault Systems for selective monitoring and protection.

The transformers measuring accuracy and repeatability is high and is not influenced by the relative position of the individual conductor passing through the transformer core. Nominal measuring range is 50 to 400Hz. Maximum ambient temperature +70 °C. The lower earth current sensitivity limit is in the region of 3 to 5 mA for the IGTx series and 5-10mA for the IGRx series.

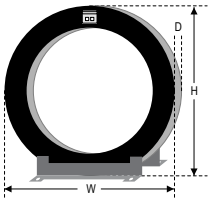
The recommended maximum distance between a residual current transformer and the Earth Current Monitoring Unit is generally 50 meters. If the distance exceeds 3 meters, or the connecting cable is exposed to heavy stray electromagnetic fields, the cable (minimum 1mm²) should be shielded. The shield should be grounded to protective earth (PE) **only** at the end closest to the monitoring unit.

Fixing Bracket			
Type	H(mm)	W(mm)	D(mm)
IGT30	49	56	35
IGT60	61	100	35
IGT60A	61	100	35
IGT110	92	155	35



Toroidal					
Type	Inner Diameter (mm)	Weight (*kg)	H (*mm)	W (*mm)	D (*mm)
IGT12	12	0,04	43	37	18
IGT30	30	0,2	55	55	28
IGT60	60	0,4	98	98	25
IGT60A	64	0,2	114	114	30
IGT110	110	0,8	154	154	25

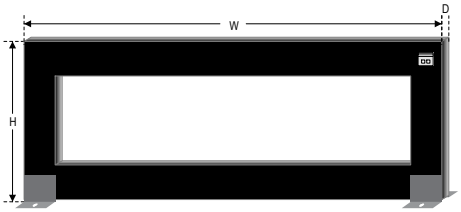
Toroidal					
Type	Inner Diameter (mm)	Weight (*kg)	H (*mm)	W (*mm)	D (*mm)
IGT160	160	2,6	224	220	30
IGT200	200	3	265	272	32



Terminal Connection

Rectangular					
Type	Inner Diameter (mm)	Weight (*kg)	H (*mm)	W (*mm)	D (*mm)
IGR2015	200x150	5	218	330	37
IGR3015	300x150	5,3	230	370	37
IGR3215	320x150	5,9	230	390	37
IGR3515	350x150	5,7	230	420	37
IGR4015	400x150	5,3	230	470	37
IGR5015	500x150	6,3	238	580	37

(other sizes on request)



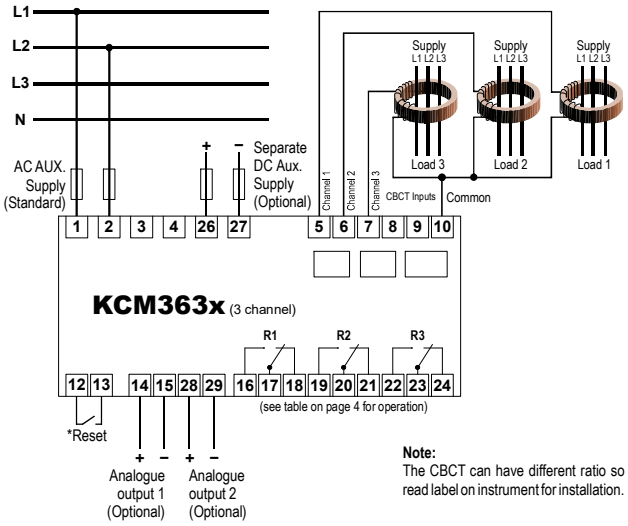
Terminal Connection

IS range

KCM363x

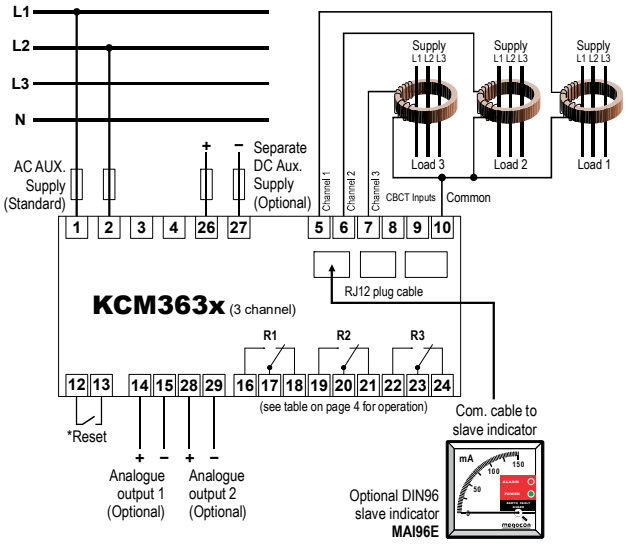
Connection Diagram

Connection Diagram without optional slave instrument



Note:
The CBCT can have different ratio so read label on instrument for installation.

Connection Diagram with optional slave instrument



***Reset**
Any latched relay is reset by linking terminals 12 and 13 or by interrupting the auxiliary voltage supply.

Analogue Output

The output signals are proportional to the meter reading (see page 4 for an overview of models and functions).

The signal is specifically intended as an input to a control system for monitoring or control.

Add suffix from table below to type designation to specify output required:

Outputs 1		Outputs 2	
O/P1	**0 - 10mA**	O/P11	**0 - 10mA**
O/P2	**0 - 20mA**	O/P12	**0 - 20mA**
O/P3	**4 - 20mA**	O/P13	**4 - 20mA**
O/P4	N/A	O/P14	N/A
O/P5	N/A	O/P15	N/A
O/P6	N/A	O/P16	N/A
O/P7	N/A	O/P17	N/A
O/P8	**0 - 10V**	O/P18	**0 - 10V**
O/P9	**0,2 - 10V**	O/P19	**0,2 - 10V**
O/P10	**4,3 - 20mA**	O/P20	**4,3 - 20mA**

Relay Contacts

Burden on supply	: 170mW per relay
Switching voltage (Max)	: 400V AC, 300V DC
Switching voltage (Rated)	: 250V AC, 30V DC
Max I continuous	: 6A RMS, 6A DC
Max breaking capacity	: 1500VA AC, 18-120W DC
Dielectric strength across Open contacts	: 1000V RMS

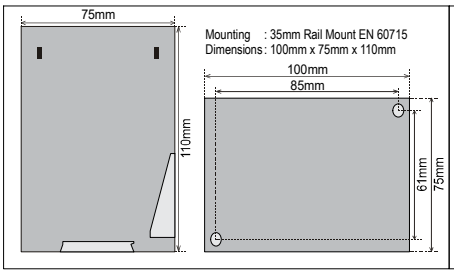
Connection

Terminal type	: Terminal Clamp and Screw
Wire max.	: T1-T4, T26-T27: AWG 24-14, T5-T10: AWG 12, other terminals: AWG 24-12
Screw Torque	: 0.5Nm

Overload

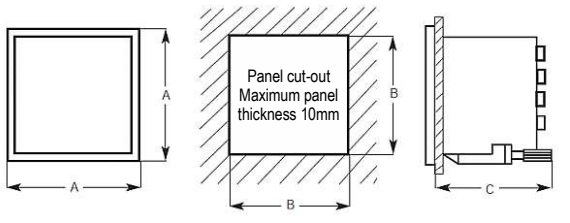
Voltage	: 1.2 x Un continuous 2 x Un for 10secs
Current	: 2.5 x In continuous 5 x In for 1secs (max 25A)

Dimensions



Slave Indicator

	A	B	C
DIN96	96 x 96mm	92 x 92mm	64mm



The MEGACON policy is one of continuous improvement, consequently equipment supplied may vary in detail from this publication.

ORDERING INFORMATION

Type	: KCM363FB
Aux. Supply	: 200-240VAC
Range	: 0-150mA
Input Current C.T.	: 3 x IGT30
Analogue output 1	: O/P3: 4-20mA
Analogue output 2	: O/P18: 0-10VDC

Optional Separate Aux. Supply:
Add **-SD** for models with Separate **DC** Aux. Supply.
(Example: KCM162FSB-**SD**)

IS range