KITZ 204

User Manual

Protocol Converter

Publication Reference: R8563G

ALSTOM

HANDLING OF ELECTRONIC EQUIPMENT

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of Alstom Grid products are immune to the relevant levels of electrostatic discharge when housed in their cases. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are a same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors.
3. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
4. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as yourself.
5. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 60147-0F.

If you are making measurements on the internal electronic circuitry of an equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.

Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available you should maintain regular contact with the case to prevent the build up of static. Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

Alstom Grid strongly recommends that detailed investigations on the electronic circuitry, or modification work, should be carried out in a Special Handling Area such as described in BS5783 or IEC 60147-0F.

1. SAFETY SECTION

This Safety Section should be read before commencing any work on the equipment.

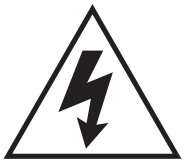
1.1 Health and Safety

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

1.2 Explanation of symbols and labels

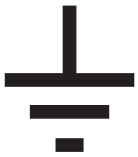
The meaning of symbols and labels may be used on the equipment or in the product documentation, is given below.

Caution: refer to product documentation



Caution: risk of electric shock

Protective/safety *earth terminal



Functional *earth terminal
Note: This symbol may also be used for a protective/safety earth terminal if that terminal is part of a terminal block or sub-assembly e.g. power supply.

*NOTE: THE TERM EARTH USED THROUGHOUT THE PRODUCT DOCUMENTATION IS THE DIRECT EQUIVALENT OF THE NORTH AMERICAN TERM GROUND.

2. INSTALLING, COMMISSIONING AND SERVICING

Equipment connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electrical shock or energy hazards.

Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5mm^2, unless otherwise stated in the technical data section of the product documentation.

Before energising the equipment, the following should be checked:

- Voltage rating and polarity;
- CT circuit rating and integrity of connections;
- Protective fuse rating;
- Integrity of earth connection (where applicable)

3. EQUIPMENT OPERATING CONDITIONS

The equipment should be operated within the specified electrical and environmental limits.

3.1 Current transformer circuits

Do not open the secondary circuit of a live CT since the high level voltage produced may be lethal to personnel and could damage insulation.

3.2 External resistors

Where external resistors are fitted to relays, these may present a risk of electric shock or burns, if touched.

3.3 Battery Replacement

Where internal batteries are fitted they should be replaced with the recommended type and be installed with the correct polarity, to avoid possible damage to the equipment.

3.4 Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

3.5 Insertion of modules and pcb cards

These must not be inserted into or withdrawn from equipment whist it is energised since this may result in damage.

3.6 Fibre optic communication

Where fibre optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.

4. OLDER PRODUCTS

Electrical adjustments

Equipments which require direct physical adjustments to their operating mechanism to change current or voltage settings, should have the electrical power removed before making the change, to avoid any risk of electrical shock.

Mechanical adjustments

The electrical power to the relay contacts should be removed before checking any mechanical settings, to avoid any risk of electric shock.

Draw out case relays

Removal of the cover on equipment incorporating electromechanical operating elements, may expose hazardous live parts such as relay contacts.

Insertion and withdrawal of extender cards

When using an extender card, this should not be inserted or withdrawn from the equipment whilst it is energised. This is to avoid possible shock or damage hazards. Hazardous live voltages may be accessible on the extender card.

Insertion and withdrawal of heavy current test plugs

When using a heavy current test plug, CT shorting links must be in place before insertion or removal, to avoid potentially lethal voltages.

5. DECOMMISSIONING AND DISPOSAL

Decommissioning: The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

Disposal: It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner. Any products containing batteries should have them removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation, may apply to the disposal of lithium batteries.

6. TECHNICAL SPECIFICATIONS

6.1 Protective fuse rating

The recommended maximum rating of the external protective fuse for this equipment is 16A, Red Spot type or equivalent, unless otherwise stated in the technical data section of the product documentation.

Insulation class:	IEC 601010-1 : 1990/A2 : 1995 Class I EN 61010-1 : 1993/A2 : 1995 Class I	This equipment requires a protective (safety) earth connection to ensure user safety.
Insulation Category (Overvoltage):	IEC 601010-1 : 1990/A2 : 1995 Category III EN 61010-1 : 1993/A2 : 1995 Category III	Distribution level, fixed installation. Equipment in this category is qualification tested at 5kV peak, 1.2/50µs, 500Ω, 0.5J, between all supply circuits and earth and also between independent circuits.
Environment:	IEC 601010-1 : 1990/A2 : 1995 Pollution degree 2 EN 61010-1 : 1993/A2 : 1995 Pollution degree 2	Compliance is demonstrated by reference to generic safety standards.
Product Safety: CE	72/23/EEC	Compliance with the European Commission Law Voltage Directive.
	EN 61010-1 : 1993/A2 : 1995 EN 60950 : 1992/A11 : 1997	Compliance is demonstrated by reference to generic safety standards.

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1. INTRODUCTION

This document details the VDEW/IEC60870-5-103 KITZ protocol converter. It describes the operation and features of the unit in sufficient detail to allow users to interface the unit to other equipment.

The VDEW/IEC60870-5-103 KITZ (KITZ204) will provide an interface between K and L Range relays, and either a VDEW protocol or IEC60870-5-103 protocol-based master station.

The KITZ204 units therefore allow integration of K and L Range relays into either a system with an existing VDEW master station or a system with an IEC60870-5-103 master station. One KITZ204 unit can be connected to up to eight relays.

The KITZ204 provides VDEW fixed messages for specific K and L Range relays only. Refer to Section 6.3 for a list of these relay types. The KITZ204 provides only the Generic Services of IEC60870-5-103 for other Courier-compatible devices.

The KITZ204 provides only standard VDEW fixed messages ("public codes"); it does not provide any "private codes".

The KITZ204 has a Real Time Clock which timestamps data to 1ms resolution.

The front RS232 port allows a Courier master station to gain local access to the connected relays and to the KITZ204 itself for configuration purposes.

The conversion between the K-Bus Courier protocol and the VDEW/IEC60870-5-103 protocol performed by the unit is transparent to the VDEW/IEC60870-5-103 master station equipment.

2. HANDLING AND INSTALLATION

The user should be familiar with the contents of the Safety Section before commencing with any work on this equipment.

2.1 Receipt of KITZ204 units

Although the KITZ204 unit is of the standard MIDOS case type construction, it requires careful handling prior to use on site. Upon receipt, the unit should be examined immediately, to ensure that no damage has been sustained in transit.

If damage has been sustained during transit, a claim should be made to the transport contractor and a representative of Alstom Grid should be promptly notified.

2.2 Electrostatic discharge (ESD)

The KITZ204 unit uses components that are sensitive to electrostatic discharges. The electronic circuits are well protected by the metal case and the internal components should not be exposed by the removal of the assembled boards from within the outer casing.

It should be noted that there are no user setting adjustments or measurements to be carried out within the unit.

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage. Often, this is not immediately apparent, but the unit's reliability will have been reduced.

When transporting the unit, care should be taken that the RS232 ports are not subjected to ESD. Touching the case will ensure that the user is at the same electrostatic potential as the unit.

More information on safe working procedures for all electronic equipment can be found in BS 5783 and IEC 147-OF. It is strongly recommended that detailed investigations on electronic circuitry or any modification work should be carried out in a Special Handling Area such as described in the above-mentioned BS and IEC documents.

2.3 Unpacking

Care should be taken when unpacking and installing the unit to prevent damage.

2.4 Storage

If the KITZ204 unit is not to be installed immediately upon receipt, it should be stored in an environment free from dust and moisture in the original carton.

Where de-humidifier bags have been included in the packing, they should be retained.

The action of the de-humidifier crystals will be impaired if the bag has been exposed to ambient conditions and may be restored by heating the bag gently for about half an hour, prior to replacing it in the carton.

Dust which collects on a carton may, on subsequent unpacking, find its way into the unit. In damp conditions, the carton and packing may become impregnated with moisture and the de-humidifier will lose its efficiency.

Storage temperature: –25ºC to +70ºC.

3. GETTING STARTED

The communication address of the KITZ204 unit is set to 255 when it leaves the factory.

The address must be changed to a unique address in the range 1 to 254 in order to communicate with the Courier master for configuration purposes. This is accomplished using Courier master software via the front port (Port 0). The Courier master software may be "Courier Access Software", "Protection Access Software & Toolkit" or "MiCOM S1".

The communication characteristics of the front port are fixed to a data rate of 19200 bits per second and 11-bit frame format (1 Start bit, 8 Data bits, 1 Even parity bit, 1 Stop bit).

To change the unit's address using "Courier Access Software" or "Protection Access Software & Toolkit", select the "New Address" option from the "Units" menu. The serial number (including the suffix letter as a capital letter) of the relay must first be entered, followed by the current (old) address of the relay (enter 255 if this is not known). Finally enter the required new address of the KITZ204, in the range 1 to 254. This address must be an address not used by any connected relay.

To change the unit's address using "MiCOM S1", select the "New Address by serial #" option from the "Device" menu, and enter the serial number and the required new address of the KITZ204, in the range 1 to 254, in the appropriate space.

Now the KITZ204 Courier database (refer to Section 12) can be accessed, in order to configure the KITZ204.

4. CONNECTION

4.1 Connection

The connection diagram for the KITZ204 is shown in the following figure:

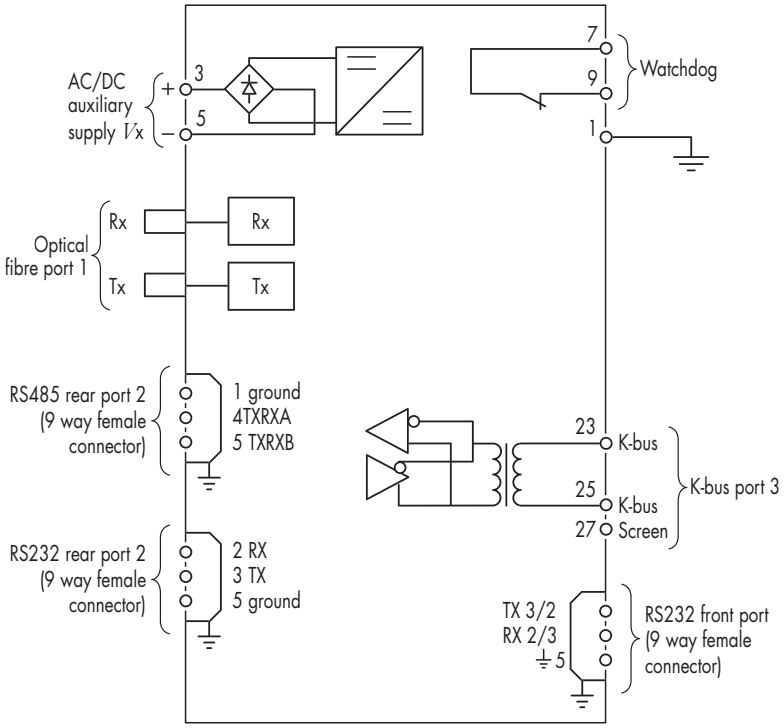

FIGURE 1 - CONNECTION DIAGRAM FOR KITZ204

The unit front panel is shown in the following figure:

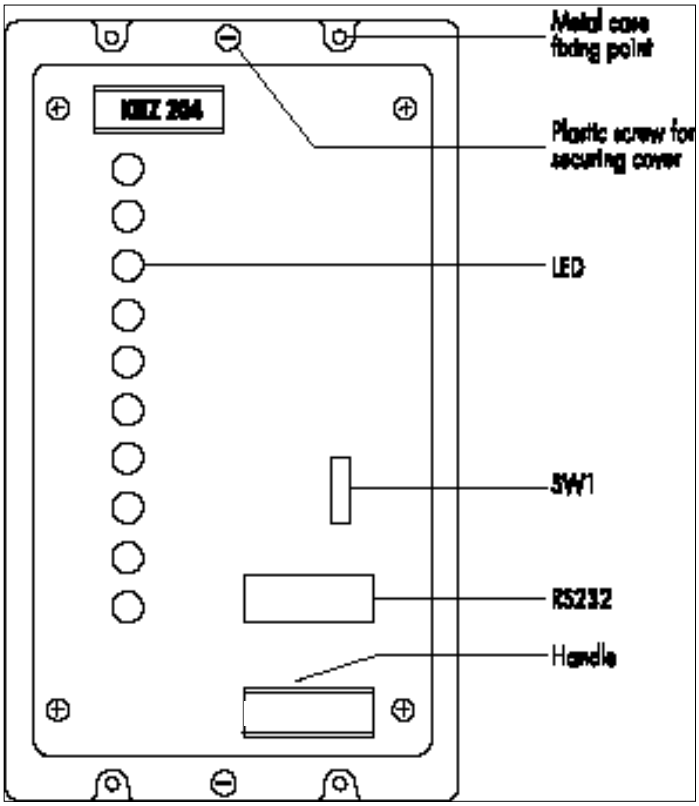

FIGURE 2 - KITZ204 FRONT PANEL LAYOUT

The unit consists of four communications ports.

Port 0 is an RS232 connection which is designed for temporary access by a Courier master and is located on the front of the unit. A switch is provided for crossing over the transmit and receive signals.

Ports 1 and 2 are for the connection of a VDEW/IEC60870-5-103 Master. The connection between the unit and the VDEW/IEC60870-5-103 master can either be 850nm multimode optical fibre (Port 1) or isolated RS232 or RS485 (Port 2).

Port 3 is for the connection of relays and is permanently configured for K-Bus.

4.1.1 Port 3 K-Bus connection

K-Bus requires a twisted pair screened cable with resistive termination on the extreme ends.

4.1.1.1 Port 3 Connection method

K-Bus is a multidrop standard. This means that a K-Bus connection can be made point to point or can be daisy-chained together with a number of other products. A chain of connected units is known as a spur and no branches may be made from the spur.

4.1.1.2 Port 3 Recommended cable

Twisted pair with outer screen, to M.O.D. DEF STANDARD 61-12 Part 5; 16 strand, 0.2mm diameter, 40mΩ per metre per core, 171pF per metre (core to core), 288pF per metre (core to screen).

4.1.1.3 Port 3 Cable termination

Termination is via three terminals on a standard MIDOS terminal block. Two terminals are for the twisted pair communications wires and the third is for the screen. The screen connection is not internally connected to the unit in any way, since the screen should be earthed at one point of the cable only – normally at the master end. The transmission wires should be terminated using a 150Ω resistor at both extreme ends of the cable. The MIDOS block terminal numbers, for connection of the K-Bus port, are given in Table 1:

Port 3	**Connection**
23	K-Bus 1
25	K-Bus 2
27	Screen (N.C.)

TABLE 1 - K-BUS CONNECTIONS.

4.1.1.4 Port 3 Cable polarity

Polarisation is not necessary for the twisted pair.

4.1.1.5 Port 3 Maximum cable length

The maximum cable length for a spur is 1000m.

4.1.1.6 Port 3 Maximum devices per spur

The maximum number of devices per KITZ204 is eight (8).

4.1.2 Port 2 RS232 (VDEW/IEC60870-5-103) connection

4.1.2.1 Port 2 RS232 Connection method

The rear RS232 port is suitable for direct point to point connection between the unit and a PC. The rear port is isolated and designed for permanent connection. No modem control signals are available.

4.1.2.2 Port 2 RS232 Recommended cable

A standard PC serial port interface cable should be used. It is essential that the cable screen be earthed at one end to ensure adequate screening. The connectors should be screw locked at each end. Reference should also be made to the PC user manual for the exact connection requirements.

4.1.2.3 Port 2 RS232 Termination

The pinout of the rear port 9-way female 'D' connector is as shown in Table 2. It is configured as Data Terminal Equipment (DTE).

Pin number	**Function**	**Direction**
SHELL	Protective ground	–
2	Received data RxD	In
3	Transmitted data TxD	Out
5	Signal ground GND	–

TABLE 2 - CONNECTION FOR THE REAR RS232 SERIAL CONNECTOR

The connection is:

KITZ204 – DTE				PC – DTE	
9				25	9
3	TXD	————	RXD	3	2
2	RXD	————	TXD	2	3
5	SG	————	SG	7	5

The earthing arrangement of the RS232 connection is for the protective ground to be connected to 0V via the case. This arrangement provides maximum screening of the RS232 signals.

The signal ground of RS232 connection is not connected to the 0V of the unit. This ensures that no earth loop currents can flow between the KITZ204 and other connected equipment.

4.1.2.4 Port 2 RS232 Cable length

The maximum cable length according to the RS232 specification is 15m, or 2500pF total cable capacitance .

4.1.3 Port 2 RS485 (VDEW/IEC60870-5-103) connection

4.1.3.1 Port 2 RS485 Connection method

The rear RS485 port is suitable for direct point to point or multidrop connection between the master and a (number of) unit(s). The rear port is isolated and designed for permanent connection.

4.1.3.2 Port 2 RS485 Recommended cable

The RS485 specification does not define connector type or pinout, so a cable suitable for connection between the KITZ204 connector, which is specified in Section 4.1.3.3 below, and that provided by the RS485 master will be needed.

4.1.3.3 Port 2 RS485 Termination

The pinout of the rear port 9-way female 'D' connector is as shown in Table 3:

Pin number	**Function**	**Direction**
SHELL	Protective ground	–
1	Signal ground GND	–
4	Data signal TXRXA	In/Out
5	Data signal TXRXB	In/Out

TABLE 3 - CONNECTION FOR THE REAR RS485 SERIAL CONNECTOR

The screen of the RS485 cable should be earthed at one point of the cable only. When earthing at the KITZ204, the screen should be connected to the 'D' connector shell which forms the protective ground and is connected to 0V via the case.

The data signal lines, TXRXA and TXRXB should be terminated at both extreme ends of the cable with resistors. The value of each resistor must be close to the characteristic impedance of the cable, which is typically 100Ω – 120Ω.

The signal ground of RS485 connection is not connected to the 0V of the unit. This ensures that no earth loop currents can flow between the KITZ204 and other connected equipment.

4.1.3.4 Port 2 RS485 Cable length

The maximum cable length according to the RS485 specification is 1000m.

4.1.4 Port 1 optical fibre (VDEW/IEC60870-5-103) connection

4.1.4.1 Port 1 optical fibre Connection method

The rear optical fibre port is suitable for direct point to point connection between the unit and a remote optical transmitter and receiver. The port consists of one Transmit fibre connection and one Receive fibre connection.

4.1.4.2 Port 1 optical fibre Recommended fibre

The optical fibre used should be 850nm multimode glass fibre (50/125μm and 62.5/125μm are suitable).

4.1.4.3 Port 1 optical fibre Termination

The BFOC/2.5 (ST®) connector type is used, in accordance with the VDEW/IEC60870-5-103 specifications.

4.1.4.4 Port 1 optical fibre length

The transmitter and receiver capabilities allow a distance of 1 km of fibre between the KITZ204 and the master connection.

4.1.5 Front Port 0 RS232 (Courier) connection

4.1.5.1 Front Port 0 RS232 Connection method

The front port is designed only to be used for temporary connection and no modem control signals are available.

4.1.5.2 Front Port 0 RS232 Recommended cable

A standard PC serial port interface cable should be used. It is essential that the cable screen be earthed at one end to ensure adequate screening. The connectors should be screw locked at each end. Reference should also be made to the PC user manual for the exact connection requirements.

4.1.5.3 Front Port 0 RS232 Termination

The pin out of the front port on the unit can be configured either as a Data Terminal Equipment (DTE) or a Data Circuit-terminating Equipment (DCE), using a crossover switch (SW1) on the front panel, the connections are listed in Table 4:

Pin number	**Function**	**Direction**
SHELL	Protective ground	–
2/3	Received data RxD	In
3/2	Transmitted data TxD	Out
5	Signal ground GND	–

TABLE 4 - CONNECTION FOR THE FRONT RS232 SERIAL CONNECTOR

The earthing arrangement of the RS232 connection is for the **protective ground** to be connected to 0V via the case. This arrangement provides maximum screening of the RS232 signals.

The signal ground is connected to 0V of the unit.

4.1.5.4 Front Port 0 RS232 Cable length

The maximum cable length according to the RS232 specification is 15m, or 2500pF total cable capacitance.

5. ALARMS AND INDICATIONS

5.1 Communication indications operation

The operation Indication of each communication port transmitter and receiver is listed in the following table:

Indication LED name	Function
P0 Rx	Front Courier Port 0 is receiving data
P0 Tx	Front Courier Port 0 is transmitting data
P1 Rx	IEC60870-5-103 Port 1 is receiving data
P1 Tx	IEC60870-5-103 Port 1 is transmitting data
P2 Rx	IEC60870-5-103 Port 2 is receiving data
P2 Tx	IEC60870-5-103 Port 2 is transmitting data
P3 Rx	K-Bus Port 3 is receiving data
P3 Tx	K-Bus Port 3 is transmitting data

TABLE 5 - KITZ204 COMMUNICATION LED FUNCTIONS.

5.2 Unit Healthy LED

The unit Healthy LED (when on) is used to indicate the following :

- The auxiliary supply is present
- The unit software has been initiated.
- The settings are valid.
- The unit has a non-default serial number.

5.3 Unit Alarm LED

The Alarm LED will reflect the alarm status ("SYS Alarms" database cell) of the unit. These are:

- Invalid settings.
- Default settings loaded on initialisation, i.e. the unit has the default serial number (000000O).

The alarm indication will also flash to indicate that a valid password has been entered via the SYSTEM DATA database column.

5.4 Alarm flags

The alarm flags (in the "SYS Alarms" database cell) indicate the set/reset state of the alarm.

Flag 0 indicates that the settings are invalid.

Flag 1 indicates that the default serial number (000000O) is being used.

An alarm condition will result in the Alarm LED being lit, the alarm bit will be set in the returned Courier status byte and the corresponding flag will be set in the "SYS Alarms" cell.

5.5 Testing LED indication operation

Options are provided in the Courier database to allow the indications to be illuminated on power-up or via setting a database cell. The duration for which the indications remain illuminated is controlled by the "IND Illum Time" setting (in the INDICATIONS column of the Courier database).

5.6 Watchdog contact operation

The watchdog relay contact (when open) indicates that the unit is healthy, as defined in Section 5.2.

6. APPLICATION NOTES

6.1 Introduction

The VDEW protocol is a communications interface recommendation of representatives of German utilities (Vereinigung Deutscher Elektrizitätswerke), which provides the ability to read the status, specific measurement values, specific event messages and disturbance records of protective relays.

IEC60870-5-103 is an international standard based on the VDEW specification (refer to Reference 1). Any product developed to the IEC60870-5-103 Companion Standard is compatible with the VDEW standard, whilst providing additional benefits. One KITZ204 unit provides the interface between up to eight K and L Range relays, and either an existing VDEW substation control system or an IEC60870-5-103 substation control system.

The KITZ204 provides VDEW fixed messages for specific K and L Range relays only. Refer to Section 6.3 below for a list of these relay types. The KITZ204 provides only the Generic Services of IEC60870-5-103 for other Courier-compatible devices.

The KITZ204 provides only standard VDEW fixed messages ("public codes"); it does not provide any "private codes".

The KITZ204 has a Real Time Clock which timestamps data to 1ms resolution. The Real Time Clock can be synchronised either by the VDEW/IEC60870-5-103 master or a Courier master.

The KITZ204 will allow simultaneous communications to be performed both between the VDEW/IEC60870-5-103 master and the connected K and L Range relays, and between the local Courier master and the connected relays.

6.2 Application diagram

The following figure illustrates the application of the KITZ204 to integrate K and L Range relays into a system with an existing VDEW master station.

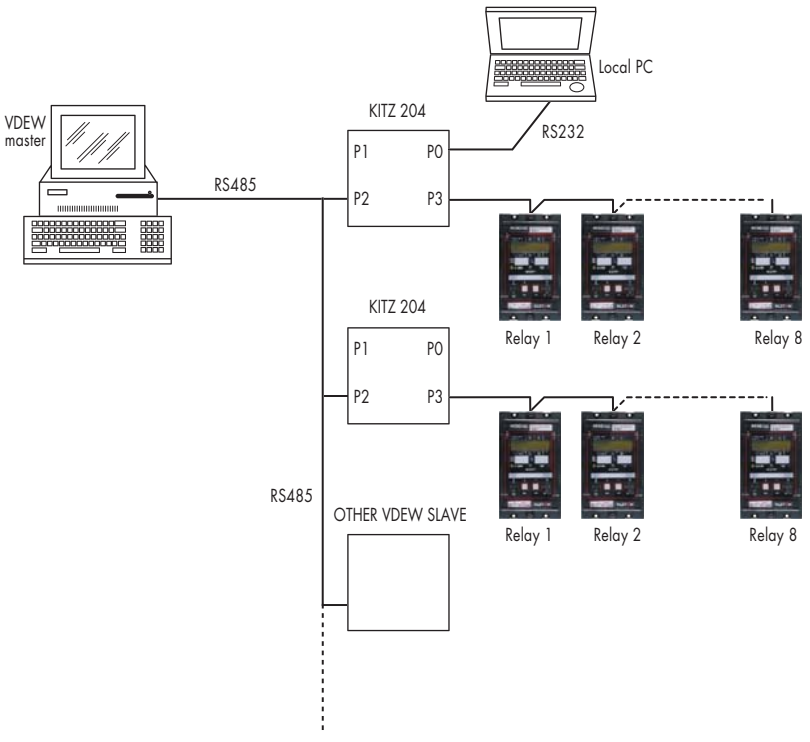

FIGURE 3 - EXAMPLE APPLICATION FOR KITZ204

Here up to eight K or L Range relays can be connected per KITZ204 unit, on K-Bus which terminates at Port 3 of the KITZ204. The KITZ204 units are then multidropped to the existing VDEW master using RS485 from Port 2.

The VDEW master communicates with other VDEW and IEC60870-5-103 protocol-compatible devices at the same time as with the K and L Range relays. Other VDEW/IEC60870-5-103 protocol-compatible devices may include disturbance recorders and relays already existing in the substation.

6.3 Relay types supported

The following relay types only are recognised by the KITZ204 and mapped to VDEW/IEC60870-5-103 fixed messages. The VDEW/IEC60870-5-103 Function Type (FUN) is given for reference.

Relay Type	**FUN (decimal)**
KCGG	160
KCGU	160
KCEG	160
KCEU	160
KMPC	160
KVTR	255
KAVR	255
KAVS	255
LGPG	255
LFZP (via KITZ 103)	128
LFZR	128
KBCH	176
KVFG	255
KVGC	255

TABLE 6 - RELAY TYPES SUPPORTED

Any other Courier-compatible device, for example an M301 measurement centre or a MiCOM relay, will be designated as "UNKNOWN" by the KITZ204 and will only support the Generic Services of IEC60870-5-103, not the VDEW fixed messages.

6.4 VDEW/IEC60870-5-103 Mode

There are four modes of operation, which define what data the KITZ204 returns to the VDEW/IEC60870-5-103 master. These are as follows:

- VDEW mode. The unit conforms to the VDEW specification (standard fixed messages only).
- IEC1 mode. As for VDEW mode plus the Generic Services.
- IEC2 mode. As for IEC1 mode but with additional event message support. (Every Courier event will be converted to an IEC format generic event message. Where fixed messages are produced, the generic event will be produced in addition to the fixed message. This will result in duplication of some data.)

- IEC3 mode. No VDEW fixed messages will be produced. Only generic event messages will be transmitted.

The mode is selected in the "UNS IEC mode" database cell (in the UNIT SETTINGS column). The generic commands of IEC60870-5-103 can be used in any of the IEC modes.

Event message handling is explained further in Section 9.4.

6.5 VDEW/IEC60870-5-103 port selection and parameters

The VDEW/IEC60870-5-103 port may be physically either optical fibre, RS232 or RS485. This is configured in the KITZ204 database as follows.

If an optical fibre connection to the VDEW/IEC60870-5-103 master is required, firstly select "Port 1" in the "UNS VDEW Port" database cell (in the UNIT SETTINGS column). The optical fibre port communication parameters can then be selected in the setting cells in the PORT 1 SETTINGS column. The optical fibre port can be configured as either "Opt Fibre Lon" (Idle Light On) or "Opt Fibre Loff" (Idle Light Off) as required, though the IEC60870-5-103 Companion Standard (Reference 1) specifies that Idle Light On only is supported.

If either an RS232 or RS485 connection to the VDEW/IEC60870-5-103 master is required, firstly select "Port 2" in the "UNS VDEW Port" database cell. Secondly select "RS485" or "RS232" as required in the "P2 Mode" database cell (in the PORT 2 SETTINGS column). The RS485/RS232 port communication parameters can then be selected in the other setting cells in the PORT 2 SETTINGS column.

The communication characteristics of the VDEW/IEC60870-5-103 port have fixed frame format (1 Start bit, 8 Data bits, 1 Even parity bit, 1 Stop bit), and the data rate is selectable in the range 1200 bits per second to 115200 bits per second.

6.6 Port priority

The priority of the ports is fixed. Port 3 (K-Bus) having the highest priority and Port 0 (front, Courier port) the lowest. The VDEW/IEC60870-5-103 ports have equal priority as only one can be active at any time.

Under normal operating conditions the unit is continuously polling any connected relays for events and automatically extracting events and storing them internally for extraction by the VDEW master. Normally the operation as a Courier master and VDEW slave are independent. In certain circumstances a VDEW request will generate a direct Courier request and under these conditions the request is slotted into the polling cycle. The VDEW direct requests have a higher priority than the Courier direct requests.

Direct slave messages received on Port 1/2 will be processed in chronological order, followed by the Port 0 messages (in chronological order) etc. If a message is received on Port 1/2 while a Port 0 message is being processed, the current message processing will be completed and the Port 1/2 message awaiting processing will then be processed.

It should be noted that the above situation only arises when both masters are requesting data direct from the relay. Under normal conditions VDEW responses can be provided direct from the KITZ memory. Port 0 messages will only normally be used to commission a relay and as such the incidence of simultaneous Port 0 and Port 1/2 messages is low.

7. K-BUS COMMUNICATIONS (PORT 3)

7.1 Initialisation

On initialisation, the KITZ204 will send a Reset Remote Link command to each Courier address in the range "AR Base Address" to "AR Base Address"+"AR No. Of Units"-1. The connected relay will either respond with a valid acknowledge or not respond at all. If the addressed connected relay responds with a valid acknowledge, the KITZ204 will interrogate the relay to determine which relay type it is. If it is a recognised relay type (see Section 6.3) then it will be shown as such in the ADDRESS RANGE column of the KITZ204 Courier database. If it is not a recognised relay type then it will be shown as “UNKNOWN”. It will also add the address to its internal poll list, thus enabling data extraction.

If the addressed connected relay does not respond, "Reset Remote Link" will be sent to that address every poll cycle until that connected relay does respond.

7.2 Normal polling

Connected relay addresses are polled cyclically, from the lowest address to the highest. When request messages are not being received on master port 0, 1 or 2, the KITZ204 will poll all connected relay addresses in the poll list with a message containing the "Poll Status" command. The current status of each connected relay address is buffered and can be extracted by a Courier master.

7.3 Busy replies from connected relays

If a connected relay sends more than a user specified number of busy replies ("P3 Busies") to the KITZ204, the KITZ will assume communication with the connected relay has failed, and send "Reset Remote Link" to that address every poll cycle until that connected relay does respond. When it does respond, normal polling is resumed. No data will be transmitted to the Courier master however until the KITZ204 receives a “Reset Remote Link” for that address via Port 0, and no data will be transmitted to the VDEW/IEC60870-5-103 master until the KITZ204 receives a “Reset CU” or “Reset FCB” on Port 1/2 for that address.

The polling of connected relay addresses via the internal poll list allows "Poll Buffer"/ "Poll Status" requests to be interleaved to all allowable addresses. This ensures that the average time for a non-busy reply for all addresses is minimal and that the status for all addresses is updated as quickly as possible.

7.4 Retries to connected relays

After a request message has been transmitted to a connected relay address, the KITZ204 will then wait for a response. If no response is received within a user specified time-out period ("P3 Reply Timer"), a user specified number of retries ("P3 Retries") will be performed. If this fails to generate a response, the KITZ204 will send "Reset Remote Link" to that address every poll cycle until that connected relay does respond. When it does respond, normal polling is resumed and the KITZ204 reacts as detailed in Section 7.3 above.

7.5 Global requests

Global requests consist of two consecutive identical messages from a Courier or VDEW/IEC60870-5-103 master. No reply messages are generated in response to global requests.

Once a valid global message (pair) has been received, these will be sent to the connected relays when all other pending requests have been completed. The KITZ204 will respond with a busy reply to any other master non-global requests (except the "Reset Remote Link" command) while a global message is being processed. "Reset Remote Link" commands received while a global message is being processed will return a valid response if the request address was present before the global command was received (i.e. the connected relay address was logged on), if not, a response will not be returned.

Global requests received at the KITZ204 while any relay is busy will be sent on to all relays as soon as all relays are non-busy. In order to improve communications reliability and security, the KITZ204 will transmit two global messages to the connected relays if the message is a "Set Real Time" command request, otherwise, three global messages will be transmitted. The time delay period between the consecutive global transmissions on Port 3 is specified by the setting "P3 Gtrans Timer" database cell. Valid global request messages received by the KITZ204 will be re-transmitted on Port 3 even if no connected relays are connected to Port 3.

8. COURIER MASTER COMMUNICATIONS (PORT 0)

8.1 Introduction

The KITZ204 Courier database is accessed via Port 0 by a PC installed with Courier master software (refer to Section 3). This software allows the user to retrieve information from each address (for the KITZ204 itself and for the connected relays) by extracting the contents of its database. It also allows authorised users to make setting changes.

Alstom Grid can supply Courier access software for use on a standard IBM-compatible PC.

This section of the manual describes the use of the KITZ204 database to configure the KITZ204 unit.

8.2 KITZ204 Courier address

The KITZ204 unit address is set to 255 (the global address) as a default condition. In order to allow configuration of the unit, it must be given an address in the range 0 to 254. Refer to Section 3.

The KITZ204 unit address must be different to any connected relays, otherwise the relay with the same address as the KITZ204 will not be accessible by the Courier master.

Global messages received by the KITZ unit will be passed on to the connected relays, and will also be processed by the KITZ itself.

8.3 Connected relays' Courier addresses

The Courier address for each of the connected relays is settable in the range 1 to 254. The KITZ204 unit can communicate with up to eight consecutive Courier addresses, starting at a user specified Courier base address. The base address is specified by the setting "AR Base Address" and is used to define the lowest Courier address that will be accepted as valid.

The maximum number of consecutive Courier addresses (starting at the Base Address) with which the KITZ204 can communicate is specified by the setting "AR No. of Units". This setting can be used as a filter to improve efficiency if only a limited number of units with sequential addresses are required.

Under normal circumstances, the connected master should not request information from non existent addresses via the KITZ204, but will send "Reset Remote Link" to each configured address each cycle.

The addresses of all the attached connected relays must not be altered once communications are established. If a connected relay is removed at any time, check that its status (in the "AR Devx Status" database cell) changes to "Logged off" before adding a new relay (of any type) with the same address. The time taken to become logged off depends on the number of retries set for Port 3.

8.4 KITZ204 Courier database

A full listing of the Courier Database is given in Section 12.

8.5 Courier passwords

The Courier interface utilises the password to prevent unauthorised access to some KITZ204 settings. To be able to modify the KITZ204 settings the user must correctly enter a four character Courier password. The KITZ204 settings are visible but not settable if the password has not been set.

To set the password first select the SYSTEM DATA column using the Courier master software. The second item within the column is the KITZ204 password.

The true value of this database cell is not visible and is instead represented as "****".

The password protection is unlocked by setting this cell to the correct value using the Courier master software. The default setting is "AAAA". The Alarm LED will flash to indicate that a valid password has been entered.

If no setting changes are made to the database for a set period of time the password unlock will self reset. This time period is specified by the "UNS Passwd Timer" setting (in the UNIT SETTINGS column).

If the password has been forgotten or lost please contact your local Alstom Grid representative.

8.6 Extended password protection

The "UNS Extended PWP" setting (in the UNIT SETTINGS column) is used to apply password protection to all communication settings within the unit. This can be used in conjunction with the remote access password protection to prevent the KITZ Unit and connected relay(s) settings from being changed remotely by unauthorised users.

8.7 Event extraction

The KITZ204 can generate the following time tagged Courier events:

- Invalid Settings in the non-volatile memory
- KITZ204 password entered via Port 0
- KITZ204 setting changed via Port 0

These are accessible via the front Courier Port 0 only.

A total of 20 Courier events can be stored in the KITZ204 internal buffers. If the event buffer becomes full, the oldest event record will be overwritten by the next event. The KITZ204 supports the standard mechanism for event extraction. The events may be displayed on the PC and stored to a file.

Relay events cannot be extracted by the Courier master.

8.8 Invalid settings

The Invalid Settings alarm ("SYS Alarms" Flag 0) indicates that the settings for the KITZ204 are invalid. This alarm will be set when the unit detects that the current settings contained in the unit's memory are invalid.

Clearing the alarm will not copy the default settings to the non-volatile area.

The default settings will only be loaded if the non-volatile settings are corrupted and the unit is re-energised. After the default settings have been loaded, "SYS Alarms" Flag 1 will be set to indicate that the default serial number (000000O) is being used. The default serial number cannot be changed by the user and a representative of Alstom Grid should be contacted. The unit will still be operational.

If new user settings have been entered to the unit, these will be stored within non-volatile memory and used by the KITZ204 unit. When the unit is powered-up with valid non-volatile settings, the invalid settings alarm will not be issued.

8.9 Time synchronisation

The KITZ204 date and time can be set from the Courier master (Port 0).

In accordance with the VDEW standard, there is no external time synchronisation (e.g. IRIG-B) input.

On receipt of a time synchronisation command from a master port, the KITZ204 reacts as follows.

If the time synchronisation command is a global command, the KITZ204 internal RTC is updated, and the Courier "Set Real Time" command is transmitted twice on Port 3 as a global command. Any connected relays with a RTC have their RTC updated.

If the time synchronisation command is sent to a specific address, and that address is a connected relay with a RTC, the Courier "Set Real Time" command is transmitted on Port 3. The connected relay with a RTC has its RTC updated.

If the time synchronisation command is sent to a specific address, and that address is a connected relay without a RTC, the KITZ204 internal RTC is updated.

9. VDEW/IEC60870-5-103 MASTER COMMUNICATIONS (PORT 1 OR PORT 2)

9.1 Principle of Protocol Conversion

The mapping of data from the relay Courier database to the data available via VDEW depends on the relay type. VDEW defines differing data, which would normally be held in a relay itself, from that used in Alstom Grid K and L Range relays. Hence some data held by the different types of K and L Range relays cannot be accessed by a VDEW master, and similarly some data defined in VDEW cannot be mapped to anything in the relay Courier database.

The relay types recognised by the KITZ204 are detailed in Section 6.3. The exact mapping of data between the relay Courier database and VDEW/IEC60870-5-103 messages is detailed for the different relay types in Sections 9.6 to 9.14 below.

The Generic Services of IEC60870-5-103 allow full access to database locations of the relays as defined by the IEC60870-5-103 Companion Standard (Reference 1). The generic commands and replies which the KITZ204 supports are also given in Sections 9.6 to 9.14 below.

9.2 KITZ204 VDEW/IEC60870-5-103 address

The KITZ204 unit is transparent to the VDEW/IEC60870-5-103 master. It is not a slave device to the VDEW/IEC60870-5-103 master, and so it does not have a VDEW/IEC60870-5-103 address.

9.3 Connected relays' VDEW/IEC60870-5-103 addresses

There are two modes by which the VDEW/IEC60870-5-103 addresses for the connected relays can be allocated. The mode is set to either "Direct" or "Indirect" in the KITZ204 "AR Addr Mapping" database cell.

If "Direct" mode is selected, then the VDEW/IEC60870-5-103 address of each connected relay is the same as its Courier address.

If "Indirect" mode is selected, then the VDEW/IEC60870-5-103 address for each connected relay can be allocated individually. When Indirect mode is selected, a database cell ("AR Devx VDEW Addr") for each of the 8 connected relays becomes visible, in which to allocate its VDEW/IEC60870-5-103 address. The VDEW/IEC60870-5-103 addresses do not have to be consecutive, and the VDEW address for each of the connected relays is settable in the range 0 to 254.

9.4 Fixed and Generic messages

The messages which are available for extraction by a VDEW/IEC60870-5-103 (Port 1/2) master, using Class 1 data retrieval, depend on the KITZ204 VDEW/IEC60870-5-103 Mode setting (detailed in Section 6.4) and on the relay type, and are detailed in Sections 9.6 to 9.14 below.

The KITZ204 automatically extracts Courier event messages from connected relays. The event message is then processed by the KITZ204 which creates VDEW fixed messages and/or IEC60870-5-103 generic messages according to its Mode setting.

In VDEW mode, only VDEW fixed messages will be created by the KITZ204. A Courier event message from the relay is converted to the corresponding VDEW fixed message, where such a fixed message exists.

In IEC1 mode, only VDEW fixed messages will be created by the KITZ204, as for VDEW mode.

In IEC2 mode, VDEW fixed messages will be created. Also, every Courier event will be converted to an IEC60870-5-103 generic event message. This results in two different event messages, but providing the same information, being created wherever the Courier event causes a VDEW fixed message.

In IEC3 mode, no VDEW fixed messages will be created. A generic event message only will be created for each Courier event.

If the Alarm bit of the Courier status byte is set in any relay, a VDEW "Group alarm" (Information Number (INF) 47) is created for that relay.

All VDEW/IEC60870-5-103 messages will be time tagged with an IEC60870 time tag (1 millisecond resolution).

After it has been initially reported (either as spontaneous information (COT=1) or in a GI response (COT=9)), only Class 1 data which has changed state is reported. This means, for example, that once all auxiliary inputs have been previously reported, then if auxiliary input 1 changes state to ON, INF 27 "Auxiliary input 1" is reported as ON (DPI=2), but INF 28, 29 and 30 (Auxiliary inputs 2, 3 and 4) are not reported as OFF.

The KITZ204 responds to a "General Interrogation" (GI) request (ASDU7) and subsequent "Poll Class 1" request, at any time, with specific Class 1 data, which will have a "Cause of Transmission" = "General Interrogation" (COT=9). The Class 1 data returned is VDEW Information Numbers 27 "Auxiliary input 1", 28 "Auxiliary input 2", 29 "Auxiliary input 3", 30 "Auxiliary input 4", 23 "Characteristic 1", 24 "Characteristic 2", 25 "Characteristic 3", 26 "Characteristic 4", 47 "Group alarm" and 84 "General start", or a subset thereof depending on the relay type.

9.5 Measurands

The measurands which are available for extraction by a VDEW/IEC60870-5-103 (Port 1/2) master, using Class 2 data retrieval, depend on the relay type and are detailed in Sections 9.6 to 9.14 below.

The KITZ204 automatically polls the relevant measurement values from connected relays, in order to regularly make updated measurands available to the VDEW/IEC60870-5-103 master. Where a specific measurement value is not available to be returned in the measurand message, that value will be set to Overflow (with "OV" bit set), as defined in Section 7.2.6.8 of the IEC60870-5-103 Companion Standard (Reference 1).

The frequency with which the KITZ204 polls the measurement values from connected relays can be set separately for each connected relay, in the KITZ204 "Devx Timer" Courier database cell (in the MEASUREMENTS column). The minimum frequency is every 10 seconds.

NOTE: A value of zero ("Devx Timer"=0) means that KITZ204 polling of measurement values is disabled, and so there will be no data in response to a Class 2 poll from the VDEW/IEC60870-5-103 master.

For compatibility with VDEW, the measurands are referenced to a Rated Value of voltage, current, power, VAr and frequency. These rated values must be entered into the KITZ204 Courier database separately for each connected relay, in the MEASUREMENTS column.

The maximum value of each of the measurands can be selected to be either "±1.2 x Rated Value" or "±2.4 x Rated Value" separately for each connected relay, in the "Devx Value" database cell (in the MEASUREMENTS column).

9.6 Mapping for KCEG/KCEU/KCGG/KCGU relays

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for these relays is 160 decimal (A0 hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KCEG1 KCEU1	KCGG1	KCEG2 KCEU2	KCGG2
8	10	End of GI	-		0	00	X	X	X	X
6	8	Time sync	-		0	00	X	X	X	X
5	3	Reset FCB	-		2	02	X	X	X	X
5	4	Reset CU	-		3	03	X	X	X	X
5	5	Start/Restart	-		4	04	X	X	X	X
5	6	Power on	-		5	05	X	X	X	X
1	9,11 20,21	AR active	c/g	X	16	10				
1	9,11 20,21	Teleprotection active	c/g	X	17	11				
1	9,11 20,21	Protection active	c/g	X	18	12				
1	11	LED Reset	c		19	13	X	X	X	X
1	9,11	Information blocking	c/g	X	20	14				
1	9,11	Test mode	c/g	X	21	15				
1	9,11	Local parameter setting in operation	c/g	X	22	16				
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X	X	X	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X	X	X	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19				
1	9,11 20,21	Characteristic 4	c/g	X	26	1A				
1	9,11	Auxiliary input 1	c/g	X	27	1B	X	X	X	X
1	9,11	Auxiliary input 2	c/g	X	28	1C	X	X	X	X
1	9,11	Auxiliary input 3	c/g	X	29	1D	X	X	X	X
1	9,11	Auxiliary input 4	c/g	X	30	1E				
1	1,7,9	Measurand supervision I	c/g	X	32	20				
1	1,7,9	Measurand supervision V	c/g	X	33	21				
1	1,7,9	Phase sequence supervision	c/g	X	35	23				

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KCEG1 KCEU1	KCGG1	KCEG2 KCEU2	KCGG2
1	1,7,9	Trip circuit supervision	c/g	X	36	24				
1	1,7,9	I>> backup operation	c/g	X	37	25				
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26				
1	1,7,9	Teleprotection disturbed	c/g	X	39	27				
1	1,7,9	Group warning	c/g	X	46	2E				
1	1,7,9	Group alarm	c/g	X	47	2F	X	X	X	X
1	1,7,9	Earth fault L1	c/g	X	48	30				
1	1,7,9	Earth fault L2	c/g	X	49	31				
1	1,7,9	Earth fault L3	c/g	X	50	32				
1	1,7,9	Earth fault forward / line	c/g	X	51	33	X	X	X	X
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34	X		X	
2	1,7,9	Start L1	c/g	X	64	40	X	X	X	X
2	1,7,9	Start L2	c/g	X	65	41	X	X	X	X
2	1,7,9	Start L3	c/g	X	66	42	X	X	X	X
2	1,7,9	Start N	c/g	X	67	43	X	X	X	X
2	1,7	General Trip	c		68	44	X	X	X	X
2	1,7	Tripping command L1	c		69	45	X	X	X	X
2	1,7	Tripping command L2	c		70	46	X	X	X	X
2	1,7	Tripping command L3	c		71	47	X	X	X	X
2	1,7	Trip I >> (backup operation)	c		72	48				
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49				
2	1,7	Fault forward / line	c		74	4A	X	X	X	X
2	1,7	Fault reverse / busbar	c		75	4B	X		X	
2	1,7	Teleprotection signal transmitted	c		76	4C				
2	1,7	Teleprotection signal received	c		77	4D				
2	1,7	Zone 1	c		78	4E				
2	1,7	Zone 2	c		79	4F				

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KCEG1 KCEU1	KCGG1	KCEG2 KCEU2	KCGG2
2	1,7	Zone 3	c		80	50				
2	1,7	Zone 4	c		81	51				
2	1,7	Zone 5	c		82	52				
2	1,7	Zone 6	c		83	53				
2	1,7,9	General Start	c/g	X	84	54	X	X	X	X
2	1,7	Breaker Failure	c		85	55				
2	1,7	Measuring system L1 trip	c		86	56				
2	1,7	Measuring system L2 trip	c		87	57				
2	1,7	Measuring system L3 trip	c		88	58				
2	1,7	Measuring system E trip	c		89	59				
2	1,7	Trip I>	c		90	5A	X	X	X	X
2	1,7	Trip I>>	c		91	5B	X	X	X	X
2	1,7	Trip I_N>	c		92	5C	X	X	X	X
2	1,7	Trip I_N>>	c		93	5D	X	X	X	X
1	1,7	ON by AR generated	c		128	80				
1	1,7	Long-time ON by AR generated	c		129	81				
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82				
3.1	2	Operating measured value I	n/a		144	90				
3.2	2	Operating measured value I,V	n/a		145	91				
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	X	X	X	X
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	X	X	X	X
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X	X	X	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X	X	X	X
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X	X	X	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KCEG1 KCEU1	KCGG1	KCEG2 KCEU2	KCGG2
11	42,43	Read directory of a single entry	n/a		243	F3	X	X	X	X
10	1,2,7,9, 11,12,4 2,43	Read value or attribute of a single entry	n/a		244	F4	X	X	X	X
10	10	End of general interrogation of generic data	n/a		245	F5	X	X	X	X
10	40,41	Write entry with confirmation	n/a		249	F9	X	X	X	X
10	40,41	Write entry with execution	n/a		250	FA	X	X	X	X
10	40	Write entry abort	n/a		251	FB	X	X	X	X

TABLE 7 - MAPPING FOR KCEG/KCEU/KCGG/KCGU RELAYS - MONITOR DIRECTION

NOTE1: INF 27 "Auxiliary input 1", 28 "Auxiliary input 2" and 29 "Auxiliary input 3" are reported as ON or OFF as applicable for a change-of-state of relay Logic Inputs 1, 2 and 3 respectively. This requires the relay to be configured with:
cell 0003 "SYS Function Links" bit 7 = 1 (“En Log Evts”=”Enabled”)
"INP Aux 1" = “00000010” (L1 allocated)
"INP Aux 2" = “00000100” (L2 allocated)
"INP Aux 3" = “00001000” (L3 allocated)

NOTE2: INF 84 "General Start" is now reported for a protection start without a trip (as well as when there is a trip). This requires the relay to be configured with:
cell 0003 "SYS Function Links" bit 7 = 1 (“En Log Evts”=“Enabled”)
cell 0B01 "RLY Io> Fwd" = “00000001” (RL0 allocated)
cell 0B02 "RLY Io> Rev" = “00000001” (RL0 allocated - KCEG/KCEU only)
cell 0B06 "RLY I> Fwd" = “00000001” (RL0 allocated)
cell 0B07 "RLY I> Rev" = “00000001” (RL0 allocated - KCEG/KCEU only)

NOTE3: When both first stage (I>) and second stage (I>>) operate for the same trip, only the second stage will be reported (INF 91 "Trip I>>").

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
146	I_{L2}	0202	Ib	
146	V_{L1-L2}	0205	Vab	KCEG/KCEU only
147	I_N	0204	In	
147	V_{EN}	020B	Vo	KCEG/KCEU only
148	I_{L1}	0201	Ia	
148	I_{L2}	0202	Ib	
148	I_{L3}	0203	Ic	
148	V_{L1-E}	0208	Van	KCEG/KCEU only
148	V_{L2-E}	0209	Vbn	KCEG/KCEU only
148	V_{L3-E}	020A	Vcn	KCEG/KCEU only
148	P	0301	P	KCEG/KCEU only
148	Q	0303	Q	KCEG/KCEU only
148	f	020C	f	

TABLE 8 - ALLOCATION OF MEASURANDS FOR KCEG/KCEU/KCGG/KCGU RELAYS

ASDU	COT	Description	Single/ Double cmd	INF dec	INF hex	KCEG1 KCEU1	KCGG1	KCEG2 KCEU2	KCGG2
7	9	GI initiation	n/a	0	00	X	X	X	X
6	8	Time sync	n/a	0	00	X	X	X	X
20	20	AR ON/OFF	D	16	10				
20	20	Protection signal transmission ON/OFF	D	17	11				
20	20	Protection effective/not effective ON/OFF	D	18	12				
20	20	LED Reset	S	19	13	X	X	X	X
20	20	Characteristic 1	S	23	17	X	X	X	X
20	20	Characteristic 2	S	24	18	X	X	X	X
20	20	Characteristic 3	S	25	19				
20	20	Characteristic 4	S	26	1A				
21	42	Read headings of all defined groups	n/a	240	F0	X	X	X	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X	X	X	X
21	42	Read directory of a single entry	n/a	243	F3	X	X	X	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X	X	X	X
21	42	General interrogation of generic data	n/a	245	F5	X*	X*	X*	X*
21	42	Write entry	n/a	248	F8	X	X	X	X
21	42	Write entry with confirmation	n/a	249	F9	X	X	X	X
21	42	Write entry with execution	n/a	250	FA	X	X	X	X
21	42	Write entry abort	n/a	251	FB	X	X	X	X

TABLE 9 - MAPPING FOR KCEG/KCEU/KCGG/KCGU RELAYS - CONTROL DIRECTION

9.7 Mapping for KMPC relay

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for this relay is 160 decimal (A0 hex).

ASDU	COT	Description	coming or coming/going	GI	INF dec	INF hex	KMPC
8	10	End of GI	-		0	00	X
6	8	Time sync	-		0	00	X
5	3	Reset FCB	-		2	02	X
5	4	Reset CU	-		3	03	X
5	5	Start/Restart	-		4	04	X
5	6	Power on	-		5	05	X
1	9,11 20,21	AR active	c/g	X	16	10	
1	9,11 20,21	Teleprotection active	c/g	X	17	11	
1	9,11 20,21	Protection active	c/g	X	18	12	
1	11	LED Reset	c		19	13	X
1	9,11	Information blocking	c/g	X	20	14	
1	9,11	Test mode	c/g	X	21	15	
1	9,11	Local parameter setting in operation	c/g	X	22	16	
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19	
1	9,11 20,21	Characteristic 4	c/g	X	26	1A	
1	9,11	Auxiliary input 1	c/g	X	27	1B	X
1	9,11	Auxiliary input 2	c/g	X	28	1C	X
1	9,11	Auxiliary input 3	c/g	X	29	1D	X
1	9,11	Auxiliary input 4	c/g	X	30	1E	
1	1,7,9	Measurand supervision I	c/g	X	32	20	
1	1,7,9	Measurand supervision V	c/g	X	33	21	

ASDU	COT	Description	coming or coming/going	GI	INF dec	INF hex	KMPC
1	1,7,9	Phase sequence supervision	c/g	X	35	23	
1	1,7,9	Trip circuit supervision	c/g	X	36	24	
1	1,7,9	I>> backup operation	c/g	X	37	25	
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26	
1	1,7,9	Teleprotection disturbed	c/g	X	39	27	
1	1,7,9	Group warning	c/g	X	46	2E	
1	1,7,9	Group alarm	c/g	X	47	2F	X
1	1,7,9	Earth fault L1	c/g	X	48	30	
1	1,7,9	Earth fault L2	c/g	X	49	31	
1	1,7,9	Earth fault L3	c/g	X	50	32	
1	1,7,9	Earth fault forward / line	c/g	X	51	33	X
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34	
2	1,7,9	Start L1	c/g	X	64	40	X
2	1,7,9	Start L2	c/g	X	65	41	X
2	1,7,9	Start L3	c/g	X	66	42	X
2	1,7,9	Start N	c/g	X	67	43	X
2	1,7	General Trip	c		68	44	X
2	1,7	Tripping command L1	c		69	45	X
2	1,7	Tripping command L2	c		70	46	X
2	1,7	Tripping command L3	c		71	47	X
2	1,7	Trip I >> (backup operation)	c		72	48	
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49	
2	1,7	Fault forward / line	c		74	4A	X
2	1,7	Fault reverse / busbar	c		75	4B	

ASDU	COT	Description	coming or coming/going	GI	INF dec	INF hex	KMPC
2	1,7	Teleprotection signal transmitted	c		76	4C	
2	1,7	Teleprotection signal received	c		77	4D	
2	1,7	Zone 1	c		78	4E	
2	1,7	Zone 2	c		79	4F	
2	1,7	Zone 3	c		80	50	
2	1,7	Zone 4	c		81	51	
2	1,7	Zone 5	c		82	52	
2	1,7	Zone 6	c		83	53	
2	1,7,9	General Start	c/g	X	84	54	X
2	1,7	Breaker Failure	c		85	55	
2	1,7	Measuring system L1 trip	c		86	56	
2	1,7	Measuring system L2 trip	c		87	57	
2	1,7	Measuring system L3 trip	c		88	58	
2	1,7	Measuring system E trip	c		89	59	
2	1,7	Trip I>	c		90	5A	X
2	1,7	Trip I>>	c		91	5B	
2	1,7	Trip I_N>	c		92	5C	X
2	1,7	Trip I_N>>	c		93	5D	
1	1,7	ON by AR generated	c		128	80	
1	1,7	Long-time ON by AR generated	c		129	81	
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82	
3.1	2	Operating measured value I	n/a		144	90	
3.2	2	Operating measured value I,V	n/a		145	91	
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	X

ASDU	COT	Description	coming or coming/going	GI	INF dec	INF hex	KMPC
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	X
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X
11	42,43	Read directory of a single entry	n/a		243	F3	X
10	1,2,7,9, 11,12,42,43	Read value or attribute of a single entry	n/a		244	F4	X
10	10	End of general interrogation of generic data	n/a		245	F5	X
10	40,41	Write entry with confirmation	n/a		249	F9	X
10	40,41	Write entry with execution	n/a		250	FA	X
10	40	Write entry abort	n/a		251	FB	X

TABLE 10 - MAPPING FOR KMPC RELAY - MONITOR DIRECTION

NOTE1: INF 27 "Auxiliary input 1", 28 "Auxiliary input 2" and 29 "Auxiliary input 3" are reported as ON or OFF as applicable for a change-of-state of relay Logic Inputs 1, 2 and 3 respectively. This requires the relay to be configured with:
cell 0003 "SYS Function Links" bit 7 = 1 (“En Log Evts”=”Enabled”)
"INP Aux 1" = “00000010” (L1 allocated)
"INP Aux 2" = “00000100” (L2 allocated)
"INP Aux 3" = “00001000” (L3 allocated)

NOTE2: INF 84 "General Start" is now reported for a protection start without a trip (as well as when there is a trip). This requires the relay to be configured with:
cell 0003 "SYS Function Links" bit 7 = 1 (“En Log Evts”=“Enabled”)
cell 0B01 "RLY Io> Fwd" = “00000001” (RL0 allocated)
cell 0B06 "RLY I> Fwd" = “00000001” (RL0 allocated)

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
146	I_{L2}	0202	Ib	
146	V_{L1-L2}	0205	Vab	
147	I_N	0204	In	
147	V_{EN}	020B	Vo	
148	I_{L1}	0201	Ia	
148	I_{L2}	0202	Ib	
148	I_{L3}	0203	Ic	
148	V_{L1-E}	0208	Van	
148	V_{L2-E}	0209	Vbn	
148	V_{L3-E}	020A	Vcn	
148	P	0301	P	
148	Q	0303	Q	
148	f	020C	f	

TABLE 11 - ALLOCATION OF MEASURANDS FOR KMPC RELAY

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	KMPC
7	9	GI initiation	n/a	0	00	X
6	8	Time sync	n/a	0	00	X
20	20	AR ON/OFF	D	16	10	
20	20	Protection signal transmission ON/OFF	D	17	11	
20	20	Protection effective/not effective ON/OFF	D	18	12	
20	20	LED Reset	S	19	13	X
20	20	Characteristic 1	S	23	17	X
20	20	Characteristic 2	S	24	18	X
20	20	Characteristic 3	S	25	19	
20	20	Characteristic 4	S	26	1A	
21	42	Read headings of all defined groups	n/a	240	F0	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X
21	42	Read directory of a single entry	n/a	243	F3	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X
21	42	General interrogation of generic data	n/a	245	F5	X*
21	42	Write entry	n/a	248	F8	X
21	42	Write entry with confirmation	n/a	249	F9	X
21	42	Write entry with execution	n/a	250	FA	X
21	42	Write entry abort	n/a	251	FB	X

TABLE 12 - MAPPING FOR KMPC RELAY - CONTROL DIRECTION

9.8 Mapping for KBCH relay

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for this relay is 176 decimal (B0 hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KBCH
8	10	End of GI	-		0	00	X
6	8	Time sync	-		0	00	X
5	3	Reset FCB	-		2	02	X
5	4	Reset CU	-		3	03	X
5	5	Start/Restart	-		4	04	X
5	6	Power on	-		5	05	X
1	9,11 20,21	AR active	c/g	X	16	10	
1	9,11 20,21	Teleprotection active	c/g	X	17	11	
1	9,11 20,21	Protection active	c/g	X	18	12	
1	11	LED Reset	c		19	13	X
1	9,11	Information blocking	c/g	X	20	14	
1	9,11	Test mode	c/g	X	21	15	
1	9,11	Local parameter setting in operation	c/g	X	22	16	
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19	
1	9,11 20,21	Characteristic 4	c/g	X	26	1A	
1	9,11	Auxiliary input 1	c/g	X	27	1B	X
1	9,11	Auxiliary input 2	c/g	X	28	1C	X
1	9,11	Auxiliary input 3	c/g	X	29	1D	X
1	9,11	Auxiliary input 4	c/g	X	30	1E	X
1	1,7,9	Measurand supervision I	c/g	X	32	20	
1	1,7,9	Measurand supervision V	c/g	X	33	21	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KBCH
1	1,7,9	Phase sequence supervision	c/g	X	35	23	
1	1,7,9	Trip circuit supervision	c/g	X	36	24	
1	1,7,9	I>> backup operation	c/g	X	37	25	
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26	
1	1,7,9	Teleprotection disturbed	c/g	X	39	27	
1	1,7,9	Group warning	c/g	X	46	2E	
1	1,7,9	Group alarm	c/g	X	47	2F	X
1	1,7,9	Earth fault L1	c/g	X	48	30	
1	1,7,9	Earth fault L2	c/g	X	49	31	
1	1,7,9	Earth fault L3	c/g	X	50	32	
1	1,7,9	Earth fault forward / line	c/g	X	51	33	
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34	
2	1,7,9	Start L1	c/g	X	64	40	
2	1,7,9	Start L2	c/g	X	65	41	
2	1,7,9	Start L3	c/g	X	66	42	
2	1,7,9	Start N	c/g	X	67	43	
2	1,7	General Trip	c		68	44	X
2	1,7	Tripping command L1	c		69	45	X
2	1,7	Tripping command L2	c		70	46	X
2	1,7	Tripping command L3	c		71	47	X
2	1,7	Trip I >> (backup operation)	c		72	48	
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49	
2	1,7	Fault forward / line	c		74	4A	
2	1,7	Fault reverse / busbar	c		75	4B	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KBCH
2	1,7	Teleprotection signal transmitted	c		76	4C	
2	1,7	Teleprotection signal received	c		77	4D	
2	1,7	Zone 1	c		78	4E	
2	1,7	Zone 2	c		79	4F	
2	1,7	Zone 3	c		80	50	
2	1,7	Zone 4	c		81	51	
2	1,7	Zone 5	c		82	52	
2	1,7	Zone 6	c		83	53	
2	1,7,9	General Start	c/g	X	84	54	
2	1,7	Breaker Failure	c		85	55	
2	1,7	Measuring system L1 trip	c		86	56	
2	1,7	Measuring system L2 trip	c		87	57	
2	1,7	Measuring system L3 trip	c		88	58	
2	1,7	Measuring system E trip	c		89	59	
2	1,7	Trip I>	c		90	5A	X
2	1,7	Trip I>>	c		91	5B	X
2	1,7	Trip I_N>	c		92	5C	
2	1,7	Trip I_N>>	c		93	5D	
1	1,7	ON by AR generated	c		128	80	
1	1,7	Long-time ON by AR generated	c		129	81	
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82	
3.1	2	Operating measured value I	n/a		144	90	X
3.2	2	Operating measured value I,V	n/a		145	91	
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KBCH
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X
11	42,43	Read directory of a single entry	n/a		243	F3	X
10	1,2,7,9, 11,12,42,43	Read value or attribute of a single entry	n/a		244	F4	X
10	10	End of general interrogation of generic data	n/a		245	F5	X
10	40,41	Write entry with confirmation	n/a		249	F9	X
10	40,41	Write entry with execution	n/a		250	FA	X
10	40	Write entry abort	n/a		251	FB	X

TABLE 13 - MAPPING FOR KBCH RELAY - MONITOR DIRECTION

NOTE: INF 27 "Auxiliary input 1", 28 "Auxiliary input 2", 29 "Auxiliary input 3" and 30 “Auxiliary input 4” are reported as ON or OFF as applicable for a change-of-state of relay Logic Inputs 1, 2, 3 and 4 respectively. This requires the relay to be configured with:

cell 0003 "SYS Function Links" bit 7 = 1 (“En Log Evts”=”Enabled”)
"INP Aux 1" = “00000010” (L1 allocated)
"INP Aux 2" = “00000100” (L2 allocated)
"INP Aux 3" = “00001000” (L3 allocated)
"INP Aux 4" = “00010000” (L4 allocated)

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
144	I_{L2}	0202	IbHV	
148	I_{L1}	0201	IaHV	
148	I_{L2}	0202	IbHV	
148	I_{L3}	0203	IcHV	
148	V_{L1-E}	-	-	
148	V_{L2-E}	-	-	
148	V_{L3-E}	-	-	
148	P	-	-	
148	Q	-	-	
148	f	020C	f	

TABLE 14 - ALLOCATION OF MEASURANDS FOR KBCH RELAY

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	KBCH
7	9	GI initiation	n/a	0	00	X
6	8	Time sync	n/a	0	00	X
20	20	AR ON/OFF	D	16	10	
20	20	Protection signal transmission ON/OFF	D	17	11	
20	20	Protection effective/not effective ON/OFF	D	18	12	
20	20	LED Reset	S	19	13	X
20	20	Characteristic 1	S	23	17	X
20	20	Characteristic 2	S	24	18	X
20	20	Characteristic 3	S	25	19	
20	20	Characteristic 4	S	26	1A	
21	42	Read headings of all defined groups	n/a	240	F0	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X
21	42	Read directory of a single entry	n/a	243	F3	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X
21	42	General interrogation of generic data	n/a	245	F5	X*
21	42	Write entry	n/a	248	F8	X
21	42	Write entry with confirmation	n/a	249	F9	X
21	42	Write entry with execution	n/a	250	FA	X
21	42	Write entry abort	n/a	251	FB	X

TABLE 15 - MAPPING FOR KBCH RELAY - CONTROL DIRECTION

9.9 Mapping for KVTR/KAVR/KAVS relays

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for these relays is 255 decimal (FF hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVTR	KAVR	KAVS
8	10	End of GI	-		0	00	X	X	X
6	8	Time sync	-		0	00	X	X	X
5	3	Reset FCB	-		2	02	X	X	X
5	4	Reset CU	-		3	03	X	X	X
5	5	Start/Restart	-		4	04	X	X	X
5	6	Power on	-		5	05	X	X	X
1	9,11 20,21	AR active	c/g	X	16	10			
1	9,11 20,21	Teleprotection active	c/g	X	17	11			
1	9,11 20,21	Protection active	c/g	X	18	12			
1	11	LED Reset	c		19	13	X	X	X
1	9,11	Information blocking	c/g	X	20	14			
1	9,11	Test mode	c/g	X	21	15			
1	9,11	Local parameter setting in operation	c/g	X	22	16			
1	9,11 20,21	Characteristic 1	c/g	X	23	17			
1	9,11 20,21	Characteristic 2	c/g	X	24	18			
1	9,11 20,21	Characteristic 3	c/g	X	25	19			
1	9,11 20,21	Characteristic 4	c/g	X	26	1A			
1	9,11	Auxiliary input 1	c/g	X	27	1B			
1	9,11	Auxiliary input 2	c/g	X	28	1C			
1	9,11	Auxiliary input 3	c/g	X	29	1D			
1	9,11	Auxiliary input 4	c/g	X	30	1E			
1	1,7,9	Measurand supervision I	c/g	X	32	20			
1	1,7,9	Measurand supervision V	c/g	X	33	21			
1	1,7,9	Phase sequence supervision	c/g	X	35	23			

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVTR	KAVR	KAVS
1	1,7,9	Trip circuit supervision	c/g	X	36	24			
1	1,7,9	I>> backup operation	c/g	X	37	25			
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26			
1	1,7,9	Teleprotection disturbed	c/g	X	39	27			
1	1,7,9	Group warning	c/g	X	46	2E			
1	1,7,9	Group alarm	c/g	X	47	2F	X	X	X
1	1,7,9	Earth fault L1	c/g	X	48	30			
1	1,7,9	Earth fault L2	c/g	X	49	31			
1	1,7,9	Earth fault L3	c/g	X	50	32			
1	1,7,9	Earth fault forward / line	c/g	X	51	33			
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34			
2	1,7,9	Start L1	c/g	X	64	40			
2	1,7,9	Start L2	c/g	X	65	41			
2	1,7,9	Start L3	c/g	X	66	42			
2	1,7,9	Start N	c/g	X	67	43			
2	1,7	General Trip	c		68	44			
2	1,7	Tripping command L1	c		69	45			
2	1,7	Tripping command L2	c		70	46			
2	1,7	Tripping command L3	c		71	47			
2	1,7	Trip I >> (backup operation)	c		72	48			
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49			
2	1,7	Fault forward / line	c		74	4A			
2	1,7	Fault reverse / busbar	c		75	4B			
2	1,7	Teleprotection signal transmitted	c		76	4C			
2	1,7	Teleprotection signal received	c		77	4D			
2	1,7	Zone 1	c		78	4E			
2	1,7	Zone 2	c		79	4F			
2	1,7	Zone 3	c		80	50			
2	1,7	Zone 4	c		81	51			
2	1,7	Zone 5	c		82	52			

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVTR	KAVR	KAVS
2	1,7	Zone 6	c		83	53			
2	1,7,9	General Start	c/g	X	84	54			
2	1,7	Breaker Failure	c		85	55			
2	1,7	Measuring system L1 trip	c		86	56			
2	1,7	Measuring system L2 trip	c		87	57			
2	1,7	Measuring system L3 trip	c		88	58			
2	1,7	Measuring system E trip	c		89	59			
2	1,7	Trip I>	c		90	5A			
2	1,7	Trip I>>	c		91	5B			
2	1,7	Trip I_N>	c		92	5C			
2	1,7	Trip I_N>>	c		93	5D			
1	1,7	ON by AR generated	c		128	80			
1	1,7	Long-time ON by AR generated	c		129	81			
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82			
3.1	2	Operating measured value I	n/a		144	90			
3.2	2	Operating measured value I,V	n/a		145	91			
3.3	2	Operating measured value I,V,P,Q	n/a		146	92			
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93			
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94			
10	42,43	Read headings of all defined groups	n/a		240	F0	X	X	X
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X	X	X
11	42,43	Read directory of a single entry	n/a		243	F3	X	X	X
10	1,2,7, 9,11, 12,42 ,43	Read value or attribute of a single entry	n/a		244	F4	X	X	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVTR	KAVR	KAVS
10	10	End of general interrogation of generic data	n/a		245	F5	X	X	X
10	40,41	Write entry with confirmation	n/a		249	F9	X	X	X
10	40,41	Write entry with execution	n/a		250	FA	X	X	X
10	40	Write entry abort	n/a		251	FB	X	X	X

TABLE 16 - MAPPING FOR KVTR/KAVR/KAVS RELAYS - MONITOR DIRECTION

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	KVTR	KAVR	KAVS
7	9	GI initiation	n/a	0	00	X	X	X
6	8	Time sync	n/a	0	00	X	X	X
20	20	AR ON/OFF	D	16	10			
20	20	Protection signal transmission ON/OFF	D	17	11			
20	20	Protection effective/not effective ON/OFF	D	18	12			
20	20	LED Reset	S	19	13	X	X	X
20	20	Characteristic 1	S	23	17			
20	20	Characteristic 2	S	24	18			
20	20	Characteristic 3	S	25	19			
20	20	Characteristic 4	S	26	1A			
21	42	Read headings of all defined groups	n/a	240	F0	X	X	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X	X	X
21	42	Read directory of a single entry	n/a	243	F3	X	X	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X	X	X
21	42	General interrogation of generic data	n/a	245	F5	X*	X*	X*
21	42	Write entry	n/a	248	F8	X	X	X
21	42	Write entry with confirmation	n/a	249	F9	X	X	X
21	42	Write entry with execution	n/a	250	FA	X	X	X
21	42	Write entry abort	n/a	251	FB	X	X	X

TABLE 17 - MAPPING FOR KVTR/KAVR/KAVS RELAYS - CONTROL DIRECTION

9.10 Mapping for KVFG relay

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for this relay is 255 decimal (FF hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVFG 122	KVFG 142
8	10	End of GI	-		0	00	X	X
6	8	Time sync	-		0	00	X	X
5	3	Reset FCB	-		2	02	X	X
5	4	Reset CU	-		3	03	X	X
5	5	Start/Restart	-		4	04	X	X
5	6	Power on	-		5	05	X	X
1	9,11 20,21	AR active	c/g	X	16	10		
1	9,11 20,21	Teleprotection active	c/g	X	17	11		
1	9,11 20,21	Protection active	c/g	X	18	12		
1	11	LED Reset	c		19	13	X	X
1	9,11	Information blocking	c/g	X	20	14		
1	9,11	Test mode	c/g	X	21	15		
1	9,11	Local parameter setting in operation	c/g	X	22	16		
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19		
1	9,11 20,21	Characteristic 4	c/g	X	26	1A		
1	9,11	Auxiliary input 1	c/g	X	27	1B	X	X
1	9,11	Auxiliary input 2	c/g	X	28	1C	X	X
1	9,11	Auxiliary input 3	c/g	X	29	1D	X	X
1	9,11	Auxiliary input 4	c/g	X	30	1E		
1	1,7,9	Measurand supervision I	c/g	X	32	20		
1	1,7,9	Measurand supervision V	c/g	X	33	21		
1	1,7,9	Phase sequence supervision	c/g	X	35	23		

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVFG 122	KVFG 142
1	1,7,9	Trip circuit supervision	c/g	X	36	24		
1	1,7,9	I>> backup operation	c/g	X	37	25		
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26		
1	1,7,9	Teleprotection disturbed	c/g	X	39	27		
1	1,7,9	Group warning	c/g	X	46	2E		
1	1,7,9	Group alarm	c/g	X	47	2F	X	X
1	1,7,9	Earth fault L1	c/g	X	48	30		
1	1,7,9	Earth fault L2	c/g	X	49	31		
1	1,7,9	Earth fault L3	c/g	X	50	32		
1	1,7,9	Earth fault forward / line	c/g	X	51	33		
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34		
2	1,7,9	Start L1	c/g	X	64	40	X	X
2	1,7,9	Start L2	c/g	X	65	41		X
2	1,7,9	Start L3	c/g	X	66	42		X
2	1,7,9	Start N	c/g	X	67	43	X	X
2	1,7	General Trip	c		68	44	X	X
2	1,7	Tripping command L1	c		69	45	X	X
2	1,7	Tripping command L2	c		70	46		X
2	1,7	Tripping command L3	c		71	47		X
2	1,7	Trip I >> (backup operation)	c		72	48		
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49		
2	1,7	Fault forward / line	c		74	4A		
2	1,7	Fault reverse / busbar	c		75	4B		
2	1,7	Teleprotection signal transmitted	c		76	4C		
2	1,7	Teleprotection signal received	c		77	4D		
2	1,7	Zone 1	c		78	4E		
2	1,7	Zone 2	c		79	4F		
2	1,7	Zone 3	c		80	50		
2	1,7	Zone 4	c		81	51		
2	1,7	Zone 5	c		82	52		

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVFG 122	KVFG 142
2	1,7	Zone 6	c		83	53		
2	1,7,9	General Start	c/g	X	84	54		
2	1,7	Breaker Failure	c		85	55	X	X
2	1,7	Measuring system L1 trip	c		86	56		
2	1,7	Measuring system L2 trip	c		87	57		
2	1,7	Measuring system L3 trip	c		88	58		
2	1,7	Measuring system E trip	c		89	59		
2	1,7	Trip I>	c		90	5A		
2	1,7	Trip I>>	c		91	5B		
2	1,7	Trip I_N>	c		92	5C		
2	1,7	Trip I_N>>	c		93	5D		
1	1,7	ON by AR generated	c		128	80		
1	1,7	Long-time ON by AR generated	c		129	81		
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82		
3.1	2	Operating measured value I	n/a		144	90		
3.2	2	Operating measured value I,V	n/a		145	91		
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	X	X
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	X	X
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X	X
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X	X
11	42,43	Read directory of a single entry	n/a		243	F3	X	X
10	1,2,7, 9,11, 12,42 ,43	Read value or attribute of a single entry	n/a		244	F4	X	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVFG 122	KVFG 142
10	10	End of general interrogation of generic data	n/a		245	F5	X	X
10	40,41	Write entry with confirmation	n/a		249	F9	X	X
10	40,41	Write entry with execution	n/a		250	FA	X	X
10	40	Write entry abort	n/a		251	FB	X	X

TABLE 18 - MAPPING FOR KVFG RELAY - MONITOR DIRECTION

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
146	I_{L2}	-	-	
146	V_{L1-L2}	0205	Vab	
147	I_N	-	-	
147	V_{EN}	020B	Vo	See Note1
148	I_{L1}	-	-	
148	I_{L2}	-	-	
148	I_{L3}	-	-	
148	V_{L1-E}	0208/0205	Van/Vab	See Note1
148	V_{L2-E}	0209/0206	Vbn/Vbc	See Note1
148	V_{L3-E}	020A	Vcn	See Note1
148	P	-	-	-
148	Q	-	-	-
148	f	020C	f	

TABLE 19 - ALLOCATION OF MEASURANDS FOR KVFG RELAY

NOTE: Depends on relay model, relay configuration and VT connection as follows.
For KVFG122 only, the VT connections are indicated by System Data Link SDA & Voltage Function Link VFC:
SDA=1 & VFC=0: Connections are Vab (Cell id 0205) & Vo (Cell id 020B)
SDA=1 & VFC=1: Connections are Van (Cell id 0208) & Vo (Cell id 020B)
SDA=0 & VFC=*: Connections are Vab (Cell id 0205) & Vbc (Cell id 0206)
For KVFG142 only, the VT may be connected, without any internal indications, as
Delta-connection: Vab & Vbc or
Star connection: Van & Vbn & Vcn
If the VT is Delta-connected, no voltage values are available.
If the VT is Star-connected, the voltages are Van, Vbn and Vcn.

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	KVFG
7	9	GI initiation	n/a	0	00	X
6	8	Time sync	n/a	0	00	X
20	20	AR ON/OFF	D	16	10	
20	20	Protection signal transmission ON/OFF	D	17	11	
20	20	Protection effective/not effective ON/OFF	D	18	12	
20	20	LED Reset	S	19	13	X
20	20	Characteristic 1	S	23	17	X
20	20	Characteristic 2	S	24	18	X
20	20	Characteristic 3	S	25	19	
20	20	Characteristic 4	S	26	1A	
21	42	Read headings of all defined groups	n/a	240	F0	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X
21	42	Read directory of a single entry	n/a	243	F3	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X
21	42	General interrogation of generic data	n/a	245	F5	X*
21	42	Write entry	n/a	248	F8	X
21	42	Write entry with confirmation	n/a	249	F9	X
21	42	Write entry with execution	n/a	250	FA	X
21	42	Write entry abort	n/a	251	FB	X

TABLE 20 - MAPPING FOR KVFG RELAY - CONTROL DIRECTION

9.11 Mapping for KVGC relay

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for this relay is 255 decimal (FF hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVGC
8	10	End of GI	-		0	00	X
6	8	Time sync	-		0	00	X
5	3	Reset FCB	-		2	02	X
5	4	Reset CU	-		3	03	X
5	5	Start/Restart	-		4	04	X
5	6	Power on	-		5	05	X
1	9,11 20,21	AR active	c/g	X	16	10	
1	9,11 20,21	Teleprotection active	c/g	X	17	11	
1	9,11 20,21	Protection active	c/g	X	18	12	
1	11	LED Reset	c		19	13	
1	9,11	Information blocking	c/g	X	20	14	
1	9,11	Test mode	c/g	X	21	15	
1	9,11	Local parameter setting in operation	c/g	X	22	16	
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19	
1	9,11 20,21	Characteristic 4	c/g	X	26	1A	
1	9,11	Auxiliary input 1	c/g	X	27	1B	
1	9,11	Auxiliary input 2	c/g	X	28	1C	
1	9,11	Auxiliary input 3	c/g	X	29	1D	
1	9,11	Auxiliary input 4	c/g	X	30	1E	
1	1,7,9	Measurand supervision I	c/g	X	32	20	
1	1,7,9	Measurand supervision V	c/g	X	33	21	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVGC
1	1,7,9	Phase sequence supervision	c/g	X	35	23	
1	1,7,9	Trip circuit supervision	c/g	X	36	24	
1	1,7,9	I>> backup operation	c/g	X	37	25	
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26	
1	1,7,9	Teleprotection disturbed	c/g	X	39	27	
1	1,7,9	Group warning	c/g	X	46	2E	
1	1,7,9	Group alarm	c/g	X	47	2F	X
1	1,7,9	Earth fault L1	c/g	X	48	30	
1	1,7,9	Earth fault L2	c/g	X	49	31	
1	1,7,9	Earth fault L3	c/g	X	50	32	
1	1,7,9	Earth fault forward / line	c/g	X	51	33	
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34	
2	1,7,9	Start L1	c/g	X	64	40	
2	1,7,9	Start L2	c/g	X	65	41	
2	1,7,9	Start L3	c/g	X	66	42	
2	1,7,9	Start N	c/g	X	67	43	
2	1,7	General Trip	c		68	44	
2	1,7	Tripping command L1	c		69	45	
2	1,7	Tripping command L2	c		70	46	
2	1,7	Tripping command L3	c		71	47	
2	1,7	Trip I >> (backup operation)	c		72	48	
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49	
2	1,7	Fault forward / line	c		74	4A	
2	1,7	Fault reverse / busbar	c		75	4B	
2	1,7	Teleprotection signal transmitted	c		76	4C	
2	1,7	Teleprotection signal received	c		77	4D	
2	1,7	Zone 1	c		78	4E	
2	1,7	Zone 2	c		79	4F	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVGC
2	1,7	Zone 3	c		80	50	
2	1,7	Zone 4	c		81	51	
2	1,7	Zone 5	c		82	52	
2	1,7	Zone 6	c		83	53	
2	1,7,9	General Start	c/g	X	84	54	
2	1,7	Breaker Failure	c		85	55	
2	1,7	Measuring system L1 trip	c		86	56	
2	1,7	Measuring system L2 trip	c		87	57	
2	1,7	Measuring system L3 trip	c		88	58	
2	1,7	Measuring system E trip	c		89	59	
2	1,7	Trip I>	c		90	5A	
2	1,7	Trip I>>	c		91	5B	
2	1,7	Trip I_N>	c		92	5C	
2	1,7	Trip I_N>>	c		93	5D	
1	1,7	ON by AR generated	c		128	80	
1	1,7	Long-time ON by AR generated	c		129	81	
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82	
3.1	2	Operating measured value I	n/a		144	90	
3.2	2	Operating measured value I,V	n/a		145	91	X
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	KVGC
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X
11	42,43	Read directory of a single entry	n/a		243	F3	X
10	1,2,7,9 ,11,12, 42,43	Read value or attribute of a single entry	n/a		244	F4	X
10	10	End of general interrogation of generic data	n/a		245	F5	X
10	40,41	Write entry with confirmation	n/a		249	F9	X
10	40,41	Write entry with execution	n/a		250	FA	X
10	40	Write entry abort	n/a		251	FB	X

TABLE 21 - MAPPING FOR KVGC RELAY - MONITOR DIRECTION

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
145	I_{L2}	0204	Iload	
145	V_{L1-L2}	0201	Vbc	
148	I_{L1}	-	-	
148	I_{L2}	0204	Iload	
148	I_{L3}	-	-	
148	V_{L1-E}	-	-	
148	V_{L2-E}	-	-	
148	V_{L3-E}	-	-	
148	P	-	-	
148	Q	-	-	
148	f	0206	f	

TABLE 22 - ALLOCATION OF MEASURANDS FOR KVGC RELAY

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	KVGC
7	9	GI initiation	n/a	0	00	X
6	8	Time sync	n/a	0	00	X
20	20	AR ON/OFF	D	16	10	
20	20	Protection signal transmission ON/OFF	D	17	11	
20	20	Protection effective/not effective ON/OFF	D	18	12	
20	20	LED Reset	S	19	13	
20	20	Characteristic 1	S	23	17	X
20	20	Characteristic 2	S	24	18	X
20	20	Characteristic 3	S	25	19	
20	20	Characteristic 4	S	26	1A	
21	42	Read headings of all defined groups	n/a	240	F0	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X
21	42	Read directory of a single entry	n/a	243	F3	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X
21	42	General interrogation of generic data	n/a	245	F5	X*
21	42	Write entry	n/a	248	F8	X
21	42	Write entry with confirmation	n/a	249	F9	X
21	42	Write entry with execution	n/a	250	FA	X
21	42	Write entry abort	n/a	251	FB	X

TABLE 23 - MAPPING FOR KVGC RELAY - CONTROL DIRECTION

9.12 Mapping for LGPG relay

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for this relay is 255 decimal (FF hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LGPG
8	10	End of GI	-		0	00	X
6	8	Time sync	-		0	00	X
5	3	Reset FCB	-		2	02	X
5	4	Reset CU	-		3	03	X
5	5	Start/Restart	-		4	04	X
5	6	Power on	-		5	05	X
1	9,11 20,21	AR active	c/g	X	16	10	
1	9,11 20,21	Teleprotection active	c/g	X	17	11	
1	9,11 20,21	Protection active	c/g	X	18	12	
1	11	LED Reset	c		19	13	X
1	9,11	Information blocking	c/g	X	20	14	
1	9,11	Test mode	c/g	X	21	15	
1	9,11	Local parameter setting in operation	c/g	X	22	16	
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19	
1	9,11 20,21	Characteristic 4	c/g	X	26	1A	
1	9,11	Auxiliary input 1	c/g	X	27	1B	
1	9,11	Auxiliary input 2	c/g	X	28	1C	
1	9,11	Auxiliary input 3	c/g	X	29	1D	
1	9,11	Auxiliary input 4	c/g	X	30	1E	
1	1,7,9	Measurand supervision I	c/g	X	32	20	
1	1,7,9	Measurand supervision V	c/g	X	33	21	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LGPG
1	1,7,9	Phase sequence supervision	c/g	X	35	23	
1	1,7,9	Trip circuit supervision	c/g	X	36	24	
1	1,7,9	I>> backup operation	c/g	X	37	25	
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26	
1	1,7,9	Teleprotection disturbed	c/g	X	39	27	
1	1,7,9	Group warning	c/g	X	46	2E	
1	1,7,9	Group alarm	c/g	X	47	2F	X
1	1,7,9	Earth fault L1	c/g	X	48	30	
1	1,7,9	Earth fault L2	c/g	X	49	31	
1	1,7,9	Earth fault L3	c/g	X	50	32	
1	1,7,9	Earth fault forward / line	c/g	X	51	33	
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34	
2	1,7,9	Start L1	c/g	X	64	40	
2	1,7,9	Start L2	c/g	X	65	41	
2	1,7,9	Start L3	c/g	X	66	42	
2	1,7,9	Start N	c/g	X	67	43	
2	1,7	General Trip	c		68	44	X
2	1,7	Tripping command L1	c		69	45	
2	1,7	Tripping command L2	c		70	46	
2	1,7	Tripping command L3	c		71	47	
2	1,7	Trip I >> (backup operation)	c		72	48	
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49	
2	1,7	Fault forward / line	c		74	4A	
2	1,7	Fault reverse / busbar	c		75	4B	
2	1,7	Teleprotection signal transmitted	c		76	4C	
2	1,7	Teleprotection signal received	c		77	4D	
2	1,7	Zone 1	c		78	4E	
2	1,7	Zone 2	c		79	4F	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LGPG
2	1,7	Zone 3	c		80	50	
2	1,7	Zone 4	c		81	51	
2	1,7	Zone 5	c		82	52	
2	1,7	Zone 6	c		83	53	
2	1,7,9	General Start	c/g	X	84	54	
2	1,7	Breaker Failure	c		85	55	
2	1,7	Measuring system L1 trip	c		86	56	
2	1,7	Measuring system L2 trip	c		87	57	
2	1,7	Measuring system L3 trip	c		88	58	
2	1,7	Measuring system E trip	c		89	59	
2	1,7	Trip I>	c		90	5A	
2	1,7	Trip I>>	c		91	5B	
2	1,7	Trip I_N>	c		92	5C	
2	1,7	Trip I_N>>	c		93	5D	
1	1,7	ON by AR generated	c		128	80	
1	1,7	Long-time ON by AR generated	c		129	81	
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82	
3.1	2	Operating measured value I	n/a		144	90	
3.2	2	Operating measured value I,V	n/a		145	91	
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	X
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	X
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LGPG
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X
11	42,43	Read directory of a single entry	n/a		243	F3	X
10	1,2,7,9 ,11,12, 42,43	Read value or attribute of a single entry	n/a		244	F4	X
10	10	End of general interrogation of generic data	n/a		245	F5	X
10	40,41	Write entry with confirmation	n/a		249	F9	X
10	40,41	Write entry with execution	n/a		250	FA	X
10	40	Write entry abort	n/a		251	FB	X

TABLE 24 - MAPPING FOR LGPG RELAY - MONITOR DIRECTION

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
146	I_{L2}	0C0C	Ib	
146	V_{L1-L2}	0C14	Vab	
147	I_N	0C20	Ie	
147	V_{EN}	0C24	Ve	
148	I_{L1}	0C08	Ia	
148	I_{L2}	0C0C	Ib	
148	I_{L3}	0C10	Ic	
148	V_{L1-E}	-	-	
148	V_{L2-E}	-	-	
148	V_{L3-E}	-	-	
148	P	0C30	Pa	A phase only
148	Q	0C34	Qa	A phase only
148	f	0C3C	f	

TABLE 25 - ALLOCATION OF MEASURANDS FOR LGPG RELAY

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	LGPG
7	9	GI initiation	n/a	0	00	X
6	8	Time sync	n/a	0	00	X
20	20	AR ON/OFF	D	16	10	
20	20	Protection signal transmission ON/OFF	D	17	11	
20	20	Protection effective/not effective ON/OFF	D	18	12	
20	20	LED Reset	S	19	13	X
20	20	Characteristic 1	S	23	17	X
20	20	Characteristic 2	S	24	18	X
20	20	Characteristic 3	S	25	19	
20	20	Characteristic 4	S	26	1A	
21	42	Read headings of all defined groups	n/a	240	F0	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X
21	42	Read directory of a single entry	n/a	243	F3	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X
21	42	General interrogation of generic data	n/a	245	F5	X*
21	42	Write entry	n/a	248	F8	X
21	42	Write entry with confirmation	n/a	249	F9	X
21	42	Write entry with execution	n/a	250	FA	X
21	42	Write entry abort	n/a	251	FB	X

TABLE 26 - MAPPING FOR LGPG RELAY - CONTROL DIRECTION

9.13 Mapping for LFZP (Optimho) via KITZ103

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for this relay is 128 decimal (80 hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZP (KITZ-103)
8	10	End of GI	-		0	00	X
6	8	Time sync	-		0	00	X
5	3	Reset FCB	-		2	02	X
5	4	Reset CU	-		3	03	X
5	5	Start/Restart	-		4	04	X
5	6	Power on	-		5	05	X
1	9,11 20,21	AR active	c/g	X	16	10	
1	9,11 20,21	Teleprotection active	c/g	X	17	11	
1	9,11 20,21	Protection active	c/g	X	18	12	
1	11	LED Reset	c		19	13	
1	9,11	Information blocking	c/g	X	20	14	
1	9,11	Test mode	c/g	X	21	15	
1	9,11	Local parameter setting in operation	c/g	X	22	16	
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19	X
1	9,11 20,21	Characteristic 4	c/g	X	26	1A	X
1	9,11	Auxiliary input 1	c/g	X	27	1B	
1	9,11	Auxiliary input 2	c/g	X	28	1C	
1	9,11	Auxiliary input 3	c/g	X	29	1D	
1	9,11	Auxiliary input 4	c/g	X	30	1E	
1	1,7,9	Measurand supervision I	c/g	X	32	20	
1	1,7,9	Measurand supervision V	c/g	X	33	21	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZP (KITZ-103)
1	1,7,9	Phase sequence supervision	c/g	X	35	23	
1	1,7,9	Trip circuit supervision	c/g	X	36	24	
1	1,7,9	I>> backup operation	c/g	X	37	25	
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26	
1	1,7,9	Teleprotection disturbed	c/g	X	39	27	
1	1,7,9	Group warning	c/g	X	46	2E	
1	1,7,9	Group alarm	c/g	X	47	2F	X
1	1,7,9	Earth fault L1	c/g	X	48	30	X
1	1,7,9	Earth fault L2	c/g	X	49	31	X
1	1,7,9	Earth fault L3	c/g	X	50	32	X
1	1,7,9	Earth fault forward / line	c/g	X	51	33	
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34	
2	1,7,9	Start L1	c/g	X	64	40	X
2	1,7,9	Start L2	c/g	X	65	41	X
2	1,7,9	Start L3	c/g	X	66	42	X
2	1,7,9	Start N	c/g	X	67	43	X
2	1,7	General Trip	c		68	44	X
2	1,7	Tripping command L1	c		69	45	X
2	1,7	Tripping command L2	c		70	46	X
2	1,7	Tripping command L3	c		71	47	X
2	1,7	Trip I >> (backup operation)	c		72	48	
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49	
2	1,7	Fault forward / line	c		74	4A	
2	1,7	Fault reverse / busbar	c		75	4B	
2	1,7	Teleprotection signal transmitted	c		76	4C	
2	1,7	Teleprotection signal received	c		77	4D	
2	1,7	Zone 1	c		78	4E	X
2	1,7	Zone 2	c		79	4F	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZP (KITZ-103)
2	1,7	Zone 3	c		80	50	X
2	1,7	Zone 4	c		81	51	
2	1,7	Zone 5	c		82	52	
2	1,7	Zone 6	c		83	53	
2	1,7,9	General Start	c/g	X	84	54	X
2	1,7	Breaker Failure	c		85	55	
2	1,7	Measuring system L1 trip	c		86	56	
2	1,7	Measuring system L2 trip	c		87	57	
2	1,7	Measuring system L3 trip	c		88	58	
2	1,7	Measuring system E trip	c		89	59	
2	1,7	Trip I>	c		90	5A	
2	1,7	Trip I>>	c		91	5B	
2	1,7	Trip I_N>	c		92	5C	
2	1,7	Trip I_N>>	c		93	5D	
1	1,7	ON by AR generated	c		128	80	
1	1,7	Long-time ON by AR generated	c		129	81	
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82	
3.1	2	Operating measured value I	n/a		144	90	
3.2	2	Operating measured value I,V	n/a		145	91	
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	X
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZP (KITZ-103)
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X
11	42,43	Read directory of a single entry	n/a		243	F3	X
10	1,2,7,9 11,12, 42,43	Read value or attribute of a single entry	n/a		244	F4	X
10	10	End of general interrogation of generic data	n/a		245	F5	X
10	40,41	Write entry with confirmation	n/a		249	F9	X
10	40,41	Write entry with execution	n/a		250	FA	X
10	40	Write entry abort	n/a		251	FB	X

TABLE 27 - MAPPING FOR LFZP (OPTIMHO) RELAY - MONITOR DIRECTION

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
146	I_{L2}	0205	Ib	
146	V_{L1-L2}	-	-	
148	I_{L1}	0204	Ia	N/A for LFZP141
148	I_{L2}	0205	Ib	
148	I_{L3}	0206	Ic	N/A for LFZP141
148	V_{L1-E}	0201	Van	N/A for LFZP141
148	V_{L2-E}	0202	Vbn	
148	V_{L3-E}	0203	Vcn	N/A for LFZP141
148	P	0207	P	
148	Q	0208	Q	
148	f	-	-	

TABLE 28 - ALLOCATION OF MEASURANDS FOR LFZP RELAY

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	LFZP (KITZ-103)
7	9	GI initiation	n/a	0	00	X
6	8	Time sync	n/a	0	00	X
20	20	AR ON/OFF	D	16	10	
20	20	Protection signal transmission ON/OFF	D	17	11	
20	20	Protection effective/not effective ON/OFF	D	18	12	
20	20	LED Reset	S	19	13	
20	20	Characteristic 1	S	23	17	X
20	20	Characteristic 2	S	24	18	X
20	20	Characteristic 3	S	25	19	X
20	20	Characteristic 4	S	26	1A	X
21	42	Read headings of all defined groups	n/a	240	F0	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X
21	42	Read directory of a single entry	n/a	243	F3	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X
21	42	General interrogation of generic data	n/a	245	F5	X*
21	42	Write entry	n/a	248	F8	X
21	42	Write entry with confirmation	n/a	249	F9	X
21	42	Write entry with execution	n/a	250	FA	X
21	42	Write entry abort	n/a	251	FB	X

TABLE 29 - MAPPING FOR LFZP (OPTIMHO) RELAY - CONTROL DIRECTION

9.14 Mapping for LFZR relay

The mapping of relay data into VDEW fixed messages and measurands is detailed in the following tables. Generic Service messages are also included.

The VDEW Function Type (FUN) for this relay is 128 decimal (80 hex).

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZR
8	10	End of GI	-		0	00	X
6	8	Time sync	-		0	00	X
5	3	Reset FCB	-		2	02	X
5	4	Reset CU	-		3	03	X
5	5	Start/Restart	-		4	04	X
5	6	Power on	-		5	05	X
1	9,11 20,21	AR active	c/g	X	16	10	
1	9,11 20,21	Teleprotection active	c/g	X	17	11	
1	9,11 20,21	Protection active	c/g	X	18	12	
1	11	LED Reset	c		19	13	X
1	9,11	Information blocking	c/g	X	20	14	
1	9,11	Test mode	c/g	X	21	15	
1	9,11	Local parameter setting in operation	c/g	X	22	16	
1	9,11 20,21	Characteristic 1	c/g	X	23	17	X
1	9,11 20,21	Characteristic 2	c/g	X	24	18	X
1	9,11 20,21	Characteristic 3	c/g	X	25	19	X
1	9,11 20,21	Characteristic 4	c/g	X	26	1A	X
1	9,11	Auxiliary input 1	c/g	X	27	1B	
1	9,11	Auxiliary input 2	c/g	X	28	1C	
1	9,11	Auxiliary input 3	c/g	X	29	1D	
1	9,11	Auxiliary input 4	c/g	X	30	1E	
1	1,7,9	Measurand supervision I	c/g	X	32	20	
1	1,7,9	Measurand supervision V	c/g	X	33	21	

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZR
1	1,7,9	Phase sequence supervision	c/g	X	35	23	
1	1,7,9	Trip circuit supervision	c/g	X	36	24	
1	1,7,9	I>> backup operation	c/g	X	37	25	
1	1,7,9	M.c.b. trip voltage circuit	c/g	X	38	26	
1	1,7,9	Teleprotection disturbed	c/g	X	39	27	
1	1,7,9	Group warning	c/g	X	46	2E	
1	1,7,9	Group alarm	c/g	X	47	2F	X
1	1,7,9	Earth fault L1	c/g	X	48	30	
1	1,7,9	Earth fault L2	c/g	X	49	31	
1	1,7,9	Earth fault L3	c/g	X	50	32	
1	1,7,9	Earth fault forward / line	c/g	X	51	33	X
1	1,7,9	Earth fault reverse / busbar	c/g	X	52	34	X
2	1,7,9	Start L1	c/g	X	64	40	
2	1,7,9	Start L2	c/g	X	65	41	
2	1,7,9	Start L3	c/g	X	66	42	
2	1,7,9	Start N	c/g	X	67	43	
2	1,7	General Trip	c		68	44	X
2	1,7	Tripping command L1	c		69	45	X
2	1,7	Tripping command L2	c		70	46	X
2	1,7	Tripping command L3	c		71	47	X
2	1,7	Trip I >> (backup operation)	c		72	48	X
4	1,7	Fault location X in Ohm per phase primary	-(c)		73	49	X
2	1,7	Fault forward / line	c		74	4A	
2	1,7	Fault reverse / busbar	c		75	4B	
2	1,7	Teleprotection signal transmitted	c		76	4C	
2	1,7	Teleprotection signal received	c		77	4D	
2	1,7	Zone 1	c		78	4E	X
2	1,7	Zone 2	c		79	4F	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZR
2	1,7	Zone 3	c		80	50	X
2	1,7	Zone 4	c		81	51	X
2	1,7	Zone 5	c		82	52	
2	1,7	Zone 6	c		83	53	
2	1,7,9	General Start	c/g	X	84	54	X
2	1,7	Breaker Failure	c		85	55	
2	1,7	Measuring system L1 trip	c		86	56	
2	1,7	Measuring system L2 trip	c		87	57	
2	1,7	Measuring system L3 trip	c		88	58	
2	1,7	Measuring system E trip	c		89	59	
2	1,7	Trip I>	c		90	5A	
2	1,7	Trip I>>	c		91	5B	
2	1,7	Trip I_N>	c		92	5C	
2	1,7	Trip I_N>>	c		93	5D	
1	1,7	ON by AR generated	c		128	80	
1	1,7	Long-time ON by AR generated	c		129	81	
1	1,7,9	AR blocked (e.g. CB not ready for AR)	c/g	X	130	82	X
3.1	2	Operating measured value I	n/a		144	90	
3.2	2	Operating measured value I,V	n/a		145	91	
3.3	2	Operating measured value I,V,P,Q	n/a		146	92	X
3.4	2	Operating measured value I_N,V_{EN}(only earth fault prot.)	n/a		147	93	X
9	2	Operating measured value I_1,I_2,I_3, V_1,V_2,V_3, P,Q,f	n/a		148	94	X
10	42,43	Read headings of all defined groups	n/a		240	F0	X

ASDU	COT	Description	coming or coming/ going	GI	INF dec	INF hex	LFZR
10	42,43	Read values or attributes of all entries of one group	n/a		241	F1	X
11	42,43	Read directory of a single entry	n/a		243	F3	X
10	1,2,7,9 ,11,12, 42,43	Read value or attribute of a single entry	n/a		244	F4	X
10	10	End of general interrogation of generic data	n/a		245	F5	X
10	40,41	Write entry with confirmation	n/a		249	F9	X
10	40,41	Write entry with execution	n/a		250	FA	X
10	40	Write entry abort	n/a		251	FB	X

TABLE 30 - MAPPING FOR LFZR RELAY - MONITOR DIRECTION

INF dec	VDEW Measurand	Relay cell	Relay measurement	Comment
146	I_{L2}	0518	Ib	
146	V_{L1-L2}	050A	Vab	
147	I_N	0526	I0	zero seq. amps
147	V_{EN}	0514	V0	zero seq. volts
148	I_{L1}	0516	Ia	
148	I_{L2}	0518	Ib	
148	I_{L3}	051A	Ic	
148	V_{L1-E}	0504	Van	
148	V_{L2-E}	0506	Vbn	
148	V_{L3-E}	0508	Vcn	
148	P	0501	P	
148	Q	0502	Q	
148	f	0503	f	

TABLE 31 - ALLOCATION OF MEASURANDS FOR LFZR RELAY

ASDU	COT	Description	Single / Double cmd	INF dec	INF hex	LFZR
7	9	GI initiation	n/a	0	00	X
6	8	Time sync	n/a	0	00	X
20	20	AR ON/OFF	D	16	10	
20	20	Protection signal transmission ON/OFF	D	17	11	
20	20	Protection effective/not effective ON/OFF	D	18	12	
20	20	LED Reset	S	19	13	X
20	20	Characteristic 1	S	23	17	X
20	20	Characteristic 2	S	24	18	X
20	20	Characteristic 3	S	25	19	X
20	20	Characteristic 4	S	26	1A	X
21	42	Read headings of all defined groups	n/a	240	F0	X
21	42	Read values or attributes of all entries of one group	n/a	241	F1	X
21	42	Read directory of a single entry	n/a	243	F3	X
21	42	Read value or attribute of a single entry	n/a	244	F4	X
21	42	General interrogation of generic data	n/a	245	F5	X*
21	42	Write entry	n/a	248	F8	X
21	42	Write entry with confirmation	n/a	249	F9	X
21	42	Write entry with execution	n/a	250	FA	X
21	42	Write entry abort	n/a	251	FB	X

TABLE 32 - MAPPING FOR LFZR RELAY - CONTROL DIRECTION

9.15 Disturbance record extraction

If the disturbance record flag is set in the status byte of a connected relay, the KITZ204 will automatically extract some header information from the disturbance record, which is then used to create a VDEW fixed message, ASDU 23 "List of Recorded Disturbances". If more than one disturbance record exists at a connected relay, only the first is accessed by the KITZ204, and so an ASDU 23 message relating to the first disturbance record only is created.

When a VDEW/IEC60870-5-103 (Port 1/2) master receives the ASDU 23, it may then send the ASDU 24 "Order for Disturbance Data Transmission" in order to start the process of extracting the disturbance record itself from the connected relay. The KITZ204 will perform the block message transfer of disturbance record data from the connected relay and convert this to VDEW/IEC60870-5-103 format. The VDEW/IEC60870-5-103 master is simply required to implement disturbance record extraction as defined in Section 7.4.7 of the IEC60870-5-103 Companion Standard (Reference 1).

If a disturbance record has not yet been extracted, the disturbance record flag is set in the status byte returned to any Courier (Port 0) master. If a disturbance record is required to be extracted by the Courier master, this is performed in the usual manner by accessing the connected relay directly.

When the disturbance record has been fully extracted, either by the VDEW/IEC60870-5-103 master or a Courier master, it is deleted from the relay. The KITZ204 will then extract the header information for the next disturbance record available at that address and create a new fixed message, if the disturbance record flag is still set in the status byte.

9.16 Time synchronisation

The KITZ204 date and time can be set from the VDEW/IEC60870-5-103 master (Port 1/2) using the ASDU 6 time synchronisation command. In accordance with the VDEW standard, there is no external time synchronisation (e.g. IRIG-B) input.

On receipt of a (single) time synchronisation command from the VDEW/IEC60870-5-103 master, the KITZ204 reacts as follows.

If the time synchronisation command is a global command, the KITZ204 internal RTC is updated, and the Courier "Set Real Time" command is transmitted twice on Port 3 as a global command. Any connected relays with a RTC have their RTC updated. An ASDU 6 message is created for every relay currently in communication to record the time synchronisation.

If the time synchronisation command is sent to a specific address, and that address is a connected relay with a RTC, the Courier "Set Real Time" command is transmitted on Port 3. The connected relay with a RTC has its RTC updated. An ASDU 6 message is created for that relay to record the time synchronisation.

If the time synchronisation command is sent to a specific address, and that address is a connected relay without a RTC, the KITZ204 internal RTC is updated. An ASDU 6 message is created for that relay to record the time synchronisation.

10. TECHNICAL DATA

10.1 Ratings – auxiliary supply

Range	Nominal (V)	Operative range (V)
Low voltage (LV)	24/125V DC	19 – 150V DC
	110V AC 50/60Hz	50 – 133V AC
High voltage (HV)	48/250V DC	33 – 300V DC
	110/230V AC 50/60Hz	87 – 265V AC

10.2 Burden – auxiliary supply

AC	< 7VA
DC	< 6W

10.3 Real time clock

RTC drift from setting at 20°C	< 1 second per 24 hours
Synchronisation error	Time setting error ±1.0ms*
Time tagging error	Current time error +0ms/–10.0ms

* Where time setting error is the accuracy of the external clock input data.

10.4 Watchdog contact

Watchdog relay	1 make (open when healthy)	
Make	10A and carry for 0.2s	
Carry	5A continuous	
Break	DC	30W resistive 15W inductive (L/R=0.04s)
Rated load	DC	5A at 30V
	AC	5A at 250V

10.5 Operation indications

Ten light emitting diodes.

10.6 Communication ports

10.6.1 Courier (RS232) Port 0

Language	Courier
Transmission	Asynchronous – RS232 voltage levels
Transmission coding	NRZ
Frame format Asynchronous 11 bits	1 start, 8 data, 1parity (even), 1 stop bits
Data rate	19200 bits per second
Cable type	RS232 serial interface lead
Cable Length	15m max. or 2500pF cable capacitance
Loading	2 units (point to point system)
Isolation	Earthed SELV circuit

10.6.2 VDEW/IEC60870-5-103 (optical fibre) Port 1

Language	VDEW/IEC60870-5-103 (default VDEW)
Transmission	Asynchronous – optical fibre
Transmission coding	ON/OFF signalling
Idle mode	Light on/light off (selectable)
Wavelength	(820 -870)nm
Frame format Asynchronous 11 bits	1 start, 8 data, 1parity (even), 1 stop bits
Data rate	1200 to 115,200 bits per second
Cable type	Glass fibre multi-mode
Cable length	1000m max.
Loading	2 units (point to point system)
Connection	BFOC/2.5 (ST®) connector to IEC60870-5-103

10.6.3 VDEW/IEC60870-5-103 (RS232) Port 2

Language	VDEW/IEC60870-5-103 (default VDEW)
Transmission	Asynchronous – RS232 voltage levels
Transmission coding	NRZ
Frame format Asynchronous 11 bits	1 start, 8 data, 1 parity (even), 1 stop bits
Data rate	1200 to 115,200 bits per second
Cable type	RS232 serial interface lead
Cable length	15m max. or 2500pF cable capacitance (up to 19,200 bits per second)
Loading	2 units (point to point system)
Isolation	SELV
Connection	9-way female ‘D’ connector

10.6.4 VDEW/IEC60870-5-103 (RS485) Port 2

Language	VDEW/IEC60870-5-103 (default VDEW)
Transmission	Asynchronous – RS485 voltage levels
Transmission coding	NRZ
Frame Format Asynchronous 11 bits	1 start, 8 data, 1 parity (even), 1 stop bits
Data rate	1200 to 115,200 bits per second
Cable type	RS485 serial interface lead
Cable length	1000m max.
Loading	Multidrop system
Isolation	SELV
Connection	9-way female 'D' connector

10.6.5 K-Bus Port 3

Language	Courier
Transmission	Synchronous – RS485 voltage levels
Transmission coding	Biphase space (differential Manchester)
Frame format	HDLC
Language	Courier
Data rate	64K bits per second
Cable type	Screened twisted pair
Cable length	1000m (maximum)
Loading	8 units (multi-drop system)
Isolation	2kV RMS for one minute
Voltage levels based on RS485 differential voltage level	
Unloaded driver differential output	±5V
Receiver input sensitivity	±200mV

10.7 High voltage withstand

Dielectric withstand IEC60255-5: 1977	2kV rms for 1 minute between case earth and the following independent circuits: the auxiliary supply, K-Bus port and relay contacts, with the terminations of each circuit wired together. 2kV rms for 1 minute between any of the following independent circuits: the auxiliary supply, K-Bus port and relay contacts, with the terminations of each circuit wired together. 2kV rms for 1 minute between any of the following independent circuits: rear RS232 SELV port, RS485 SELV port, K-Bus port and relay contacts, with the terminations of each circuit wired together. 1kV rms for 1 minute between the auxiliary supply and the following independent circuits: rear RS232 SELV port, RS485 SELV port, with the terminations of each circuit wired together. 1kV rms for 1 minute between case earth and the following independent circuits: rear RS232 SELV port, RS485 SELV port, with the terminations of each circuit wired together.
High voltage impulse IEC60255-5: 1977	Three positive and three negative impulses of 5kV peak, 1.2/50μs, 0.5J between terminals of the same circuit (except relay contacts, RS232 and RS485 ports), between independent circuits (except RS232 and RS485 ports), and between all terminals connected together and case earth (except RS232 and RS485 ports). Three positive and three negative impulses of 1kV peak, 1.2/50μs, 0.5J applied between the auxiliary supply and rear RS232 and RS485 ports, and between rear RS232 and RS485 ports wired together and case earth.
Insulation resistance IEC60255-5: 1977	$>100M\Omega$

10.8 Electrical environment

DC supply interruptions IEC60255-11: 1979	The unit will withstand a 10ms interruption in the auxiliary supply, under normal operating conditions, without de-energising.
AC ripple on DC supply IEC60255-11:1979	The unit will withstand 12% ripple on the DC supply.
AC supply voltage dips and interruptions EN 61000-4-11:1994	The unit will withstand voltage dips of 100%, 60%, and 30%, in the auxiliary power supply for a duration of 10ms, under normal operating conditions, without de-energising. The unit will withstand a 10ms interruption in the auxiliary power supply, under normal operating conditions, without de-energising.
High frequency disturbance IEC60255-22-1: 1988 Class III	2.5kV peak between auxiliary supply, watchdog contacts, K-Bus ports, port and case earth. 2.5kV peak between the cable screen of the rear RS232, RS485, K-Bus ports and case earth. 2.5kV peak between auxiliary supply and the watchdog contacts. 1.0kV peak across the supply terminals.
Surge immunity EN 61000-4-5:1995 Level IV and level III	4kV peak, 1.2/50μs applied between the auxiliary supply, K-Bus port, RS485 port and case earth. 2kV peak, 1.2/50μs applied between the terminals of the auxiliary supply. 2kV peak, 1.2/50μs applied between the RS232 port and case earth.
Fast transient disturbance IEC60255-22-4: 1992 Class IV	4kV, 2.5kHz applied directly between the auxiliary supply, watchdog relay contacts and case earth. 4kV, 2.5kHz applied via a capacitive clamp to the rear RS232, RS485 and K-Bus ports.

Electrostatic discharge	
EN 61000-4-2: 1995 Level 3	8kV discharge in air with cover in place and cover removed.
	6kV point contact discharge with cover in place and cover removed.
EMC compliance	
89/336/EEC	Compliance with the European Commission Directive on EMC is claimed via the Technical Construction File route.
EN 50081-2: 1994 EN 50082-2: 1995	Generic Standards were used to establish conformity.

10.9 Product safety

73/23/EEC	Compliance with European Commission Low Voltage Directive.
EN61010-1: 1993/A2: 1995 1992/A11: 1997	Compliance is demonstrated by reference EN60950: to generic safety standards.

10.10 Environment

Temperature	
IEC60255-6: 1998	Storage and transit –25°C to +70°C Operating –25°C to +55°C
IEC60068-2-1: 1990/A2: 1994	Cold
IEC60068-2-2: 1974/A2: 1994	Dry heat
Humidity	
IEC60068-2-3: 1969	56 days at 93% RH and +40°C
Enclosure protection	
IEC60529: 1989	IP50 (dust protected)

10.11 Mechanical environment

Vibration	
IEC60255-21-1: 1988	Response Class 2 Endurance Class 2
Shock and bump	
IEC60255-21-2: 1988	Shock response Class 2 Shock withstand Class 1 Bump Class 1
Seismic	
IEC60255-21-3: 1993	Class 2

10.12 User tests

To avoid possible degradation of insulation by repeated type testing, it is recommended that insulation tests, if required, are performed at 500V dc. The insulation resistance should be greater than 100Ω.

11. COMMISSIONING, PROBLEM SOLVING AND MAINTENANCE

11.1 General

The user should be familiar with the contents of the Safety Section before commencing with any work on this equipment.

11.2 Commissioning instructions

11.2.1 Commissioning preliminaries

The KITZ204 unit should be configured using the "Courier Access Software" (CAS), "Protection Access Software & Toolkit (PAS&T)" or "MiCOM S1" running on a PC, with at least one relay. Refer to R8514 "Protection Access Software & Toolkit", R8515 "Courier Access Software" or the "MiCOM S1" manual for all information about the software package.

11.2.1.1 Module connection

Reference should be made to Section 4 of this manual and to the user manual of the computer (PC) on which the PAS&T software is to be run.

11.2.1.2 Electrostatic discharge (ESD)

See recommendations in Section 2.2 of this manual before handling the module.

11.2.1.3 Inspection

Carefully examine the unit and case to verify if no damage has occurred since installation.

11.2.1.4 Earthing

Mains earthing

The KITZ204 unit must be earthed.

If the mains supply is not earthed, the KITZ204 unit earthing connection on the rear of the case must be used to connect the unit to a local (mains) earth.

K-Bus earthing

The K-Bus cable screen should only be connected to earth at one point in the communication system. This will normally involve connecting the cable at the Master end (i.e. at the KITZ204) and not at any other point.

11.2.1.5 Insulation

Insulation tests only need to be done when required.

Isolate all wiring from the earth and test the insulation with an electronic or brushless insulation tester at a DC voltage not exceeding 1000V. Terminals of the same circuit should be temporarily strapped together. The main groups on the unit are given below:

- Auxiliary supply voltage
- K-Bus Port 3
- Watchdog relay contacts
- Case earth

This test should not be performed on the RS232 port at the front of the unit as this is not isolated.

11.2.1.6 Equipment required

The KITZ204 unit requires the following:

AC/DC voltmeter 0 – 300V

A Portable PC running PAS&T

Any supported Courier-compatible (K-Bus) device.

11.2.2 Auxiliary supply tests

The unit will operate from either a 110V or 110/230V AC supply or a 24/125V DC or 48/250V DC battery supply, depending on the KITZ204 version. The incoming voltage must be within the operating range specified in the table below:

Range	Nominal (V)	Operative range (V)
Low voltage (LV)	24/125V DC	19 – 150V DC
	110V AC 50/60Hz	50 – 133V AC
High voltage (HV)	48/250V DC	33 – 300V DC
	110/230V AC 50/60Hz	87 – 265V AC

11.2.3 Configuration

The KITZ204 does not have any external switches for setting its parameters (other than the Port 0 DTE/DCE switch). The unit can only be configured by running the "Courier Access Software" (CAS), "Protection Access Software & Toolkit" (PAS&T) or "MiCOM S1" on a PC connected to the RS232 front port (Port 0) of the KITZ204.

The very first time the unit is powered up, a PC running PAS&T or CAS must be connected to the front port to give the unit an address (refer to Section 3) and to configure the settings. After initial configuration, the new settings will be held in the unit's non-volatile memory.

The communication characteristics of the front port are fixed to a data rate of 19200 bits per second and 11-bit frame format (1 Start bit, 8 Data bits, 1 Even parity bit, 1 Stop bit).

The pin out of the front port on the unit can be configured either as a Data Terminal Equipment (DTE) or a Data Circuit-terminating Equipment (DCE), using a crossover switch (SW1) on the front panel.

Once communication is established with the KITZ204 via the PAS&T software, the KITZ204's own database can be uploaded for viewing its default parameters. The settings for the rear communication ports can be now be modified. The full database is presented in Section 12.

11.2.4 Testing communication port operation

After the KITZ204 settings have been configured as required, connect the VDEW/IEC60870-5-103 master to Port 1/2 (use the appropriate RS232 or RS485 or Optical Fibre connections).

Send "Reset CU" or "Reset FCB" commands to initialise communications with connected relay addresses. Request event data from the connected relays (Class 1 poll) and confirm that appropriate messages are returned. Request measurands data from the connected relays (Class 2 poll) and confirm that appropriate measurands are returned.

11.3 Problem solving guide

Common operational faults are listed in this section. The solutions offered are for guidance only.

11.3.1 All indications are off

- Check correct auxiliary supply is present.
- Check external fuse (if present).

11.3.2 Green supply indication is off and alarm indication is on

- An error in the setting data has been detected.
- Default serial number has been loaded.

If the unit is de-energised then re-energised after a non-recoverable setting error has occurred, the default settings will be loaded (these are listed in Section 12).

If this occurs, the unit will have the default serial number 000000O and a Unit Address of 255 (global). The address will have to be changed to a unique address (see Section 3).

After the address has been changed, the password protected settings can be accessed by using the default password "AAAA" (this can also be changed if required).

11.3.3 No communications

Indication status: Port 0 or 1/2 receive indication is Off when communicating with a master

- Check master is polling for data.

Indication status : Port 3 transmit indication is On and Port 3 receive indication is Off when communicating with a master (and Relay) :

- Relay is not communicating (incorrect address/not configured etc.): refer to the Service Manual of the Relay.
- Two relays are using the same address, all addresses must be unique.
- No termination resistors fitted to K-Bus, or incorrect value.
- K-Bus is not a single spur (no branches are allowed)

Indication status : Port 0 or 1/2 receive indication is On, Port 3 transmit indication is On, Port 3 receive indication is On and the corresponding Port 0 or 1/2 transmit indication is Off when communicating with a master (and relay):

- The master is completing a transfer sequence that has been interrupted when the KITZ204 unit was de-energised then re-energised.

11.3.4 Slow communications response (many retries)

- No termination resistor fitted to K-Bus, or incorrect value.
- K-Bus exceeds 1000m
- K-Bus cable specification not as recommended in Section 4.1.1.2
- Frequent or large amount of data transfer is being performed from a master connected to another port.
- Setting change sequence in progress on another port (Check "P0 Set Timer" or "P1 Set Timer" or "P2 Set Timer" value is not too long).
- Block transfer sequence(s) in progress on another port (Check "P0 Block Timer" or "P1 Block Timer" or "P2 Block Timer" value is not too long).

11.3.5 Cannot access one or more of the connected relays within the specified address range

- Check that the "AR Base Address" and "AR No. of Units" settings (in the ADDRESS RANGE column) correspond to the addresses of the connected relays polled by the master.
- Check that the address setting of the connected relay is correct.
- Check that the KITZ204 "SYS Unit Address" is not set to the same value as one of the Downstream address.
- Check that two or more of the connected relays do not have the same address setting.

11.3.6 Master station time out

- Increase the Max Busies setting of the master (see the relevant publication).
- Increase the KITZ204 "P3 Busies" setting.
- Increase the KITZ204 "P3 Trans Delay" timer setting.

11.3.7 Connected Courier downstream relay communications is slow when communicating via the KITZ204.

- Increase the KITZ204 "P3 Trans Delay" timer setting.

11.4 Maintenance

11.4.1 Battery replacement (2013 onwards)

Units manufactured after 2012 don't have the facility for field replacement of the battery. These units should be returned to the approved repair centre for battery replacement.

11.4.2 Battery replacement (Pre 2012)

The battery within the KITZ204 is provided to maintain the Real Time Clock to the correct date and time, following an interruption of the auxiliary input supply.

If the battery is removed from its socket the date and time will start from 00:00:00: 1996 Jan 01. No warning will be given to reset the date and time.

11.4.2.1 Instructions for replacing the battery

For personal safety, ensure that auxiliary DC/AC supplies are isolated from the unit.

Take off the front cover and pull the unit out of its case. As viewed from the front, the right hand side screen plate should be removed by unscrewing the four attaching screws. After undoing the two screws securing the power supply board (ZJ0358), use the tip of a screwdriver to prize the board off from the end connector.

Place the board on a conductive surface, with the electronic components facing upwards, taking care to place a non-conductive spacer such as a piece of cardboard underneath the battery (see Warning below).

Gently extract the battery from its socket, using a small screwdriver to prize the battery free.

WARNING: TO AVOID DISCHARGING A BATTERY, IT SHOULD NOT BE PLACED ON A CONDUCTIVE SURFACE WITH ITS LEGS IN CONTACT WITH THE SURFACE. THE REPLACEMENT BATTERY SHOULD BE REMOVED FROM ITS PACKAGING AND PLACED INTO THE BATTERY HOLDER. THE FLAT AREA ON THE HOLDER SHOULD BE ALIGNED WITH THE FLAT AREA ON THE BATTERY. AFTER REPLACING THE BATTERY, THE UNIT SHOULD BE RE-BUILT BY FOLLOWING THE PROCEDURE DESCRIBED ABOVE IN REVERSE ORDER.

11.4.2.2 Post modification tests

Energise the KITZ204 and verify that it is functioning normally. Set it to the correct date and time. Power the unit down for at least 10 seconds and back on. Check that the correct time has been maintained.

11.4.2.3 Battery replacement type

The correct replacement battery type is: FB2325H2 from Rayovac, rated at nominal parameters of 3V and 360mAh.

11.4.2.4 Battery shelf life and replacement interval

Under normal storage conditions, the expected shelf life of the battery is 10 years. Under normal operating conditions, the battery should be replaced after 10 years.

11.4.2.5 Battery disposal

The battery should be removed from the unit and have its legs cut off before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation may apply to the disposal of lithium batteries.

12. COURIER DATABASE SETTINGS

12.1 System Data

Col	Row	Menu text	Example value(s)	Cell type	Default	Password protection
00	00	SYSTEM DATA				
00	01	SYS Language	English	Setting	English	
			French			
			German			
			Spanish			
00	02	SYS Password	AAAA	Setting	AAAA	Yes
00	04	SYS Description	**********	Setting	16 Characters	Yes
00	05	SYS Plant Ref.	**********	Setting	16 Characters	Yes
00	06	SYS Model No.	KITZ20401D12CE	Data Cell		
00	08	SYS Serial No.	123456A	Data Cell	000000O	
00	0A	SYS Comms Level	1	Data Cell	1	
00	0B	SYS Unit Address	1	Data Cell	255	
00	11	SYS Soft Ref	18 KITZ 400 I	Data Cell		
00	22	SYS Alarms	00	Data Cell		

12.1.1 Language

For model numbers KITZ20401D12CE and KITZ20401D15CE, the KITZ204 database is available in English language only.

For model numbers KITZ20401D12CM and KITZ20401D15CM, the KITZ204 database can be configured in one of the following languages:

English
French
German
Spanish

12.1.2 Password

Password Protection is provided for database access. This four character password must be entered to allow protected database cells to be accessed.

12.1.3 Description

This alphanumeric value is for a textual description (e.g. Reference of associated protection relays).

12.1.4 Plant Reference

This alphanumeric value should be used to refer to the location (e.g. Panel).

12.1.5 Model Number

This character string is fixed and contains the full unit model number.

12.1.6 Serial Number

This seven character string (six numbers and an alpha character) is fixed and contains the relay serial number.

12.1.7 Communications Level

This data cell identifies the level of the Courier language supported by the unit.

12.1.8 Unit Address

This refers to the Courier address of the unit on the communications network.

12.1.9 Software Reference

This contains the reference number of component parts of the software contained within the unit.

12.1.10 Alarms

This cell indicates the status of the unit alarms.

12.2 Unit Settings

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
04	00	UNIT SETTINGS						
04	04	UNS Extended PWP	Disabled Enabled	0 to 1	1	Setting	Disabled	Yes
04	08	UNS Menu Access	Normal Advanced	0 to 1	1	Setting	Normal	Yes
04	0C	UNS IEC mode	VDEW IEC1 IEC2 IEC3	0 to 3	1	Setting	VDEW	Yes
04	10	UNS Passwd Timer	2 min	1 to 30 min	1 min	Setting	2 min	Yes
04	14	UNS VDEW Port	Port 1 Port 2	1 to 2	1	Setting	Port 1	Optional

12.2.1 Extended Password Protection

Enables additional password protection for communications port settings. These settings are marked as “Optional” Password Protection.

12.2.2 Menu Access

This setting hides advanced communications port settings.

12.2.3 IEC Mode

This setting allows the method of event message reporting to the VDEW/IEC60870-5-103 master to be selected.

12.2.4 Password Timer

This is the time period for which the System Password remains active (after being entered or the last setting change).

12.2.5 VDEW Port

This setting allows the VDEW master port to be selected as Port 1 (fibre) or Port 2 (electrical).

12.3 Port 0 Settings

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
08	00	PORT 0 SETTINGS						
08	08	P0 Setting Timer	2 min	1 to 30 min	1 min	Setting	2 min	Optional
08	0C	P0 Block Timer	5 min	1 to 30 min	1 min	Setting	2 min	Optional
08	10	P0 Reply Timer	10ms	5 to 100 ms	5ms	Setting	5ms	Optional
08	14	P0 Reset Timer	5ms	5 to 100 ms	5ms	Setting	5ms	Optional
08	1C	P0 Add Time Tag	Disabled Enabled	0 to 1	1	Setting	Disabled	Optional

12.3.1 Port 0 Setting Timer

This setting is the time-out value applied to setting changes and setting change message interleaving when access is made via the front port.

Cell is visible if cell 0408 = “Advanced”.

12.3.2 Port 0 Block Timer

This setting is the time-out value applied to “Blocked” message transfer interleaving when access is made via the front port.

Cell is visible if cell 0408 = “Advanced”.

12.3.3 Port 0 Reply Timer

This setting is the maximum time delay before a reply is generated after a valid request is received on the front port of the unit (Excluding globally addressed requests and the reset remote link request). The reply may be “busy”. No reply is generated if the address is not valid or communications has not already been established with the address.

Cell is visible if cell 0408 = “Advanced”.

12.3.4 Port 0 Reset Timer

This setting is the maximum time delay before a reply is generated after a valid reset remote link request is received on the front port of the unit. No reply is generated if the address is not valid or communications has not already been established with the address.

Cell is visible if cell 0408 = “Advanced”.

12.3.5 Port 0 Add Time Tag

This setting appends a real time tag to the front port response messages.

12.4 Port 1 Settings

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
0C	00	PORT 1 SETTINGS						
0C	08	P1 Mode	Opt Fibre Lon Opt Fibre Loff	0 to 1	1	Setting	Opt Fibre Lon	Optional
0C	0C	P1 Data rate	1200 Baud 2400 Baud 3600 Baud 4800 Baud 7200 Baud 9600 Baud 14400 Baud 19200 Baud 28800 Baud 38400 Baud 57600 Baud 115200 Baud		1	Setting	9600 Baud	Optional
0C	14	P1 Setting Timer	10 min	1 to 30 min	1 min	Setting	2 min	Optional
0C	18	P1 Block Timer	12 min	1 to 30 min	1 min	Setting	2 min	Optional
0C	1C	P1 Reply Timer	10ms	5 to 500ms	5ms	Setting	50ms	Optional
0C	20	P1 Reset Timer	5ms	5 to 500ms	5ms	Setting	50ms	Optional

12.4.1 Port 1 Mode

This setting selects the Port 1 optical fibre mode of transmission: Light On when line idle, or Light Off when line idle.

Cell is visible if cell 0414 = “Port 1”.

12.4.2 Port 1 Data Rate

This setting selects the data rate used for VDEW/IEC60870-5-103 communications (via Optical Fibre). The above data rates only are supported.

Cell is visible if cell 0414 = “Port 1” .

12.4.3 Port 1 Setting Timer

This setting is the time-out value applied to setting changes and setting change message interleaving when access is made via the rear port 1.

Cell is Visible if cell 0408 = “Advanced” and cell 0414 = “Port 1”.

12.4.4 Port 1 Block Timer

This setting is the time-out value applied to “Blocked” message transfer interleaving when access is made via the rear port 1.

Cell is visible if cell 0408 = “Advanced” and cell 0414 = “Port 1”.

12.4.5 Port 1 Reply Timer

This setting is the maximum time delay before a reply is generated after a valid request is received on rear port 1 of the unit (Excluding globally addressed requests and the reset remote link request). The reply may be "busy". No reply is generated if the address is not valid or communications has not already been established with the address.

Cell is visible if cell 0408 = "Advanced" and cell 0414 = "Port 1".

12.4.6 Port 1 Reset Timer

This setting is the maximum time delay before a reply is generated after a valid reset remote link request is received on the rear port 1 of the unit. No reply is generated if the address is not valid or communications has not already been established with the address.

Cell is visible if cell 0408 = "Advanced" and cell 0414 = "Port 1".

12.5 Port 2 Settings

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
10	00	PORT 2 SETTINGS						
10	08	P2 Mode	RS485 RS232	0 to 1	1	Setting	RS485	Optional
10	0C	P2 Data Rate	1200 Baud 2400 Baud 3600 Baud 4800 Baud 7200 Baud 9600 Baud 14400 Baud 19200 Baud 28800 Baud 38400 Baud 57600 Baud 115200 Baud	0 to 11	1	Setting	9600 Baud	Optional
10	14	P2 Setting Timer	15 min	1 to 30 min	1 min	Setting	2 min	Optional
10	18	P2 Block Timer	5 min	1 to 30 min	1 min	Setting	2 min	Optional
10	1C	P2 Reply Timer	10ms	5 to 500ms	5ms	Setting	50ms	Optional
10	20	P2 Reset Timer	5ms	5 to 500ms	5ms	Setting	50ms	Optional

12.5.1 Port 2 Mode

This setting selects the Port 2 interface physical interface and operational protocol, RS485 or RS232 electrical interface.

Cell is visible if cell 0414 = "Port 2".

12.5.2 Port 2 Data Rate

This setting selects the data rate used for VDEW/IEC60870-5-103 communications (via RS232 or RS485). The above data rates only are supported.

Cell is visible if cell 0414 = "Port 2".

12.5.3 Port 2 Setting Timer

This setting is the time-out value applied to setting changes and setting change message interleaving when access is made via the rear port 2.

Cell is visible if cell 0408 = "Advanced" and cell 0414 = "Port 2".

12.5.4 Port 2 Block Timer

This setting is the time-out value applied to "Blocked" message transfer interleaving when access is made via the rear Port 2.

Cell is visible if cell 0408 = "Advanced" and cell 0414 = "Port 2".

12.5.5 Port 2 Reply Timer

This setting is the maximum time delay before a reply is generated after a valid request is received on rear port 2 of the unit (Excluding globally addressed requests and the reset remote link request). The reply may be "busy". No reply is generated if the address is not valid or communications has not already been established with the address.

Cell is visible if cell 0408 = "Advanced" and cell 0414 = "Port 2".

12.5.6 Port 2 Reset Timer

This setting is the maximum time delay before a reply is generated after a valid reset remote link request is received on the rear port 2 of the unit. No reply is generated if the address is not valid or communications has not already been established with the address.

Cell is visible if cell 0408 = "Advanced" and cell 0414 = "Port 2".

12.6 Port 3 Settings

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
14	00	PORT 3 SETTINGS						
14	04	P3 Reply Timer	10ms	5 to 100ms	5ms	Setting	15ms	Optional
14	08	P3 Retries	20	0 to 99	1	Setting	10	Optional
14	0C	P3 Busies	50	0 to 999	1	Setting	99	Optional
14	10	P3 GTrans Timer	5ms	5 to 1000ms	5ms	Setting	10ms	Optional
14	14	P3 Trans Delay	10ms	0 to 1000ms	10ms	Setting	10ms	Optional

12.6.1 Port 3 Reply Timer

This setting is the maximum time delay that the KITZ204 will wait for a response from a connected relay before performing a retry.

12.6.2 Port 3 Retries

This setting is the maximum number of retries (of the same request) that will be performed by the KITZ204 when a response from a connected relay is not received within the Port 3 Reply Time duration. If no reply is received and the maximum number of retries have been sent, the KITZ204 issues a 'Reset Remote Link' request to that address.

12.6.3 Port 3 Busy Replies

This setting is the maximum number of busy reply responses from a connected relay (to a request for data) that will be accepted by the KITZ204. If the maximum number of busy responses has been exceeded, the KITZ204 issues a 'Reset Remote Link' request to that address.

12.6.4 Port 3 Global Message Transmission Timer

This is the time delay period for transmission of globally addressed (address 255) Courier request messages. A valid global message consists of two or three identical messages sent sequentially with this time delay between the individual messages.

12.6.5 Port 3 Message Transmission Delay Timer

This is the time delay period between transmission of successive messages on Port 3. This can be used to decrease the number of messages sent to a connected relay over a given time period and will reduce the number of busy replies received when a low number of connected relays are connected to Port 3.

This setting can also be used to reduce the downstream transmission bandwidth to simplify downstream message interrogation.

12.7 Indications

Col	Row	Menu text	Values	Setting range	Step size	Cell type	Default	Password protection
1C	00	INDICATIONS						
1C	08	IND Pwr Up Enab	Disabled Enabled	0 to 1	1	Setting	Enabled	
1C	0C	IND Illum Time	s	1 to 60s	1s	Setting	2s	
1C	10	IND Illuminate	Disabled Enabled	0 to 1	1	Setting	Disabled	

12.7.1 Illuminate Indications On Power-Up Test

This setting enables the power-up Indications test.

12.7.2 Indications Test Illumination Time

This setting controls the duration that the indications will remain illuminated during the power-up and menu activated indication tests.

12.7.3 Illuminate Indications Test

This cell allows the indications to be tested "on the fly".

12.8 Real Time Clock

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
20	00	REAL TIME CLOCK						
20	04	RTC Time/Date	97:08:25 13:45:26	YY:MM: DD hh:mm: ss		Data Cell		

12.8.1 Date and Time

This read only cell displays the current date and time.

12.9 Communications statistics

Col	Row	Menu text	Values	Cell type	Default	Password protection
24	00	COMMS STATISTICS				
24	04	CS Reset Totals	No Yes	Setting	Yes	Optional
24	08	CS Reset Errors	No Yes	Setting	Yes	Optional
24	0C	CS P0 Total Mesg		Data Cell	0	
24	10	CS P0 Error Mesg		Data Cell	0	
24	14	CS P1 Total Mesg		Data Cell	0	
24	18	CS P1 Error Mesg		Data Cell	0	
24	1C	CS P2 Total Mesg		Data Cell	0	
24	20	CS P2 Error Mesg		Data Cell	0	
24	24	CS P3 Total Mesg		Data Cell	0	
24	28	CS P3 Error Mesg		Data Cell	0	

12.9.1 Reset Communication Total Message Statistics

This setting resets the total received message statistics for all communication ports.

Cell is visible if cell 0408 = “Advanced”.

12.9.2 Reset Communication Total Message Error Statistics

This setting resets the total received error message statistics for all communication ports.

Cell is visible if cell 0408 = “Advanced”.

12.9.3 Port 0 Communication Total Messages Received

This data cell displays the total number of messages received on the front communication port.

Cell is visible if cell 0408 = “Advanced”.

12.9.4 Port 0 Communication Total Error Message Received

This data cell displays the total number of messages received with errors on the front communication port.

Cell is visible if cell 0408 = “Advanced”.

12.9.5 Port 1 Communication Total Messages Received

This data cell displays the total number of messages received on the rear communication port 1.

Cell is visible if cell 0408 = “Advanced”.

12.9.6 Port 1 Communication Total Error Message Received

This data cell displays the total number of messages received with errors on the rear communication port 1.

Cell is visible if cell 0408 = “Advanced”.

12.9.7 Port 2 Communication Total Messages Received

This data cell displays the total number of messages received on the rear communication port 2.

Cell is visible if cell 0408 = “Advanced”.

12.9.8 Port 2 Communication Total Error Message Received

This data cell displays the total number of messages received with errors on the rear communication port 2.

Cell is visible if cell 0408 = “Advanced”.

12.9.9 Port 3 Communication Total Messages Received

This data cell displays the total number of messages received on the rear communication port 3.

Cell is visible if cell 0408 = “Advanced”.

12.9.10 Port 3 Communication Total Error Message Received

This data cell displays the total number of messages received with errors on the rear communication port 3.

Cell is visible if cell 0408 = “Advanced”.

12.10 Address Range

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
28	00	ADDRESS RANGE						
28	04	AR Base Address	1	1 to 241	8	Setting	1	Optional
28	08	AR No. of Units	8	0 to 8	1	Setting	8	Optional
28	0C	AR Addr Mapping	Direct Indirect	0 to 1	1	Setting	0	Optional
28	10	AR Dev1 VDEW Addr	1	0 to 254	1	Setting	1	Optional
28	14	AR Dev2 VDEWAddr	2	0 to 254	1	Setting	2	Optional
28	18	AR Dev3 VDEW Addr	3	0 to 254	1	Setting	3	Optional
28	1C	AR Dev4 VDEWAddr	4	0 to 254	1	Setting	4	Optional
28	20	AR Dev5 VDEW Addr	5	0 to 254	1	Setting	5	Optional
28	24	AR Dev6 VDEWAddr	6	0 to 254	1	Setting	6	Optional
28	28	AR Dev7 VDEW Addr	7	0 to 254	1	Setting	7	Optional
28	2C	AR Dev8 VDEWAddr	8	0 to 254	1	Setting	8	Optional
28	30	AR Dev1 Status	KCGG110			Data Cell		
28	34	AR Dev2 Status	KCEU142			Data Cell		
28	38	AR Dev3 Status	LOGGED OFF			Data Cell		
28	3C	AR Dev4 Status	KBCH			Data Cell		
28	40	AR Dev5 Status	LGPG			Data Cell		
28	44	AR Dev6 Status	UNKNOWN			Data Cell		
28	48	AR Dev7 Status	KVGC202			Data Cell		
28	3C	AR Dev8 Status	LOGGED OFF			Data Cell		

12.10.1 Base Address

This is the base reference Courier address and is used to define the lowest relay Courier address that will be accessed. The unit can communicate with up to 8 consecutive Courier addresses starting at the Base Address. Communication with addresses 0 and the global address (255) are allowed at all times.

The KITZ204 Courier address (in the SYSTEM DATA column) operates independently of this setting and can be set to any address (1 to 254).

12.10.2 Number of Connected relays

This is the total number of consecutive Courier addresses (starting at the Base Address) with which the KITZ204 is required to communicate, the maximum being 8. This setting can be used as a filter to improve efficiency if only a limited number of units are required.

12.10.3 Address Mapping

This setting allows the method of mapping VDEW addresses to Courier addresses to be selected. If set to "Direct", then the VDEW address of each relay is automatically set the same as the Courier address.

If set to "Indirect", then the VDEW address is allocated individually for each relay in the appropriate "Devx VDEW Addr" cells.

12.10.4 Devx VDEW Address

This setting defines the individual VDEW address of each connected relay. The VDEW address can therefore be set different to the Courier address for any of the relays. The range of valid VDEW addresses is 0 to 254.

Cell is visible if cell 280C = "Indirect".

12.10.5 Devx Status

This cell displays the type of relay which the KITZ204 has detected at each of the consecutive Courier addresses.

The KITZ204 will display "UNKNOWN" for any unrecognised Courier device, and "Logged Off" where no relay is detected.

12.11 Measurements

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
2C	00	MEASUREMENTS						
2C	04	Dev1 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	08	Dev1 Rated Value V				Setting	500kV	
2C	0C	Dev1 Rated Value I				Setting	1kA	
2C	10	Dev1 Rated Value P				Setting	10kW	
2C	14	Dev1 Rated Value VAr				Setting	5kvar	
2C	18	Dev1 Rated Value f				Setting	100Hz	
2C	1C	Dev1 Value	1.2 x rated value 2.4 x rated value	0 to 1	1	Setting	1.2 x rated value	
2C	20	Dev2 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	24	Dev2 Rated Value V				Setting	500kV	
2C	28	Dev2 Rated Value I				Setting	1kA	
2C	2C	Dev2 Rated Value P				Setting	10kW	
2C	30	Dev2 Rated Value VAr				Setting	5kvar	
2C	34	Dev2 Rated Value f				Setting	100Hz	
2C	38	Dev2 Value	1.2 x rated value 2.4 x rated value	0 to 1	1	Setting	1.2 x rated value	
2C	3C	Dev3 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	40	Dev3 Rated Value V				Setting	500kV	
2C	44	Dev3 Rated Value I				Setting	1kA	
2C	48	Dev3 Rated Value P				Setting	10kW	
2C	4C	Dev3 Rated Value VAr				Setting	5kvar	
2C	50	Dev3 Rated Value f				Setting	100Hz	

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
2C	54	Dev3 Value	1.2 x rated value 2.4 x rated value	0 to 1	1	Setting	1.2 x rated value	
2C	58	Dev4 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	5C	Dev4 Rated Value V				Setting	500kV	
2C	60	Dev4 Rated Value I				Setting	1kA	
2C	64	Dev4 Rated Value P				Setting	10kW	
2C	68	Dev4 Rated Value VAr				Setting	5kvar	
2C	6C	Dev4 Rated Value f				Setting	100Hz	
2C	70	Dev4 Value	1.2 x rated value 2.4 x rated value	0 to 1	1	Setting	1.2 x rated value	
2C	74	Dev5 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	78	Dev5 Rated Value V				Setting	500kV	
2C	7C	Dev5 Rated Value I				Setting	1kA	
2C	80	Dev5 Rated Value P				Setting	10kW	
2C	84	Dev5 Rated Value VAr				Setting	5kvar	
2C	88	Dev5 Rated Value f				Setting	100Hz	
2C	8C	Dev5 Value	1.2 x rated value 2.4 x rated value	0 to 1	1	Setting	1.2 x rated value	
2C	90	Dev6 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	94	Dev6 Rated Value V				Setting	500kV	
2C	98	Dev6 Rated Value I				Setting	1kA	
2C	9C	Dev6 Rated Value P				Setting	10kW	
2C	A0	Dev6 Rated Value VAr				Setting	5kvar	
2C	A4	Dev6 Rated Value f				Setting	100Hz	

Col	Row	Menu text	Example value(s)	Setting range	Step size	Cell type	Default	Password protection
2C	A8	Dev6 Value	1.2 x rated value 2.4 x rated value	0 to 1	1	Setting	1.2 x rated value	
2C	AC	Dev7 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	B0	Dev7 Rated Value V				Setting	500kV	
2C	B4	Dev7 Rated Value I				Setting	1kA	
2C	B8	Dev7 Rated Value P				Setting	10kW	
2C	BC	Dev7 Rated Value VAr				Setting	5kvar	
2C	C0	Dev7 Rated Value f				Setting	100Hz	
2C	C4	Dev7 Value	1.2 x	0 to 1	1	Setting	1.2 x rated value	
2C	C8	Dev8 Timer	1 min	0 to 15 min	1 min	Setting	0	
2C	CC	Dev8 Rated Value V				Setting	500kV	
2C	D0	Dev8 Rated Value I				Setting	1kA	
2C	D4	Dev8 Rated Value P				Setting	10kW	
2C	D8	Dev8 Rated Value VAr				Setting	5kvar	
2C	DC	Dev8 Rated Value f				Setting	100Hz	
2C	E0	Dev8 Value	1.2 x rated value 2.4 x rated value	0 to 1	1	Setting	1.2 x rated value	

12.11.1 Devx Timer

This setting allows the poll interval for measurements to be set for each relay. This is the time interval at which the KITZ204 will poll measurement data from the relay in order to update its internal memory.

The setting range is 0 to 15 minutes, where a setting of 0 disables polling for measurement data from that relay.

12.11.2 Devx Rated Value Voltage

This setting allows the rated voltage for the relay to be entered, in order for the measurands to be scaled.

12.11.3 DevX Rated Value Current

This setting allows the rated current for the relay to be entered, in order for the measurands to be scaled.

12.11.4 DevX Rated Value Power

This setting allows the rated power for the relay to be entered, in order for the measurands to be scaled.

12.11.5 DevX Rated Value Var

This setting allows the rated VAr for the relay to be entered, in order for the measurands to be scaled.

12.11.6 DevX Rated Value Frequency

This setting allows the system frequency for the relay to be entered, in order for the measurands to be scaled.

12.11.7 DevX Value

VDEW allows for the maximum measurand value, relative to the rated value, to be selected. In accordance with the VDEW specification, the following can be selected:

Maximum value = ± 1.2 x Rated value

Maximum value = ± 2.4 x Rated value

13. REFERENCES

The following documents should be considered in addition to this manual.

IEC60870-5-103: Telecontrol Equipment And Systems, Part 5: Transmission Protocols, Section 103: Companion Standard for the Informative Interface of Protection Equipment. October 1997.

14. GLOSSARY

Courier	An Alstom Grid communications language developed to provide generic control, monitoring, data extraction and setting changes on remote devices (primarily on protective relays) within the substation environment.
DCE	'Data Circuit-terminating Equipment'. A device providing a communication path for use by a DTE. DCE is the standard port available on a modem.
DTE	'Data Terminal Equipment'. A device acting as a source or destination (or both) for data during a communication session. DTE is the standard port available on a PC.
IEC60870	Same as IEC 870.
IEC60870-5	International standard for telecontrol equipment and systems around which the VDEW protocol is based.
IEC60870-5-103	Companion communications standard based on IEC60870-5 which contains, as a subset the VDEW protocol with the addition of generic services loosely based around the Courier protocol.
IEC60870-5 FT1.2	The communication standard which is used to transfer Courier data over RS232 connections.
K-Bus	The 64 kbps twisted pair cable used to connect Courier compatible devices and transfer Courier data.
KITZ	Interface unit for Courier slave devices, including KITZ 101, KITZ 102, KITZ 201, KITZ204.
M.O.D.	UK Ministry of Defence
PC	Personal computer.
RTC	Real Time Clock. Holds the device date and time.
VDEW	Vereinigung Deutscher Elektrizitätswerke.
SELV circuit	A secondary circuit which is so designed and protected that, under normal and single fault conditions, its voltages do not exceed a safe value. Safe voltages are defined as less than 42.4V peak or 60V dc. (EN 60950: 1992/A5: 1998).

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