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1. ELEXANT PROFIBUS INTERFACE

Profibus is an open field, supplier-independent network standard, whose interface permits a vast application in processes, manufacture and building automation. Profibus is firmly established with IEC 61158, alongside seven other fieldbus systems. On a Profibus network, in order to achieve fast and deterministic response times small packets of data are used for data exchange. This restricts the amount of data that can be read and written for a single Profibus device.

1.1 Configurations

The Elexant Profibus implementation supports the following configurations:

- Single Phase controller without integrated Safety Limiter (4020i)
- Single Phase controller with integrated Safety Limiter (4020i-LIM)
- Three Phase controller without integrated Safety Limiter (4020i-3PH)

The expected data unit within the configuration data packet for each of these configurations along with the contents of the input and output data packets for each of these configurations is defined in the following paragraphs.

1.1.1 Single Phase without Safety Limiter (4020i)

This section describes expected configuration data unit, input and output data packets for a Single Phase Elexant unit (4020i) without a Safety Limiter.

1.1.1.1 Expected Configuration Data Unit

Profibus data expected each configuration data unit for a Single Phase without Safety Limiter unit is in the form of:

0xC0 0x83 0x8E – 4 bytes output data, 15 bytes input data

1.1.1.2 Input Data Packet

Byte Offset	Information Conveyed	Units	Decimal Places	Data Format
0 1	Temperature of Temperature Sensor 1	C or F	0	16-bit signed
2 3	Temperature of Temperature Sensor 2	C or F	0	16-bit signed
4 5	Temperature of Temperature Sensor 3	C or F	0	16-bit signed
6 7	Control Temperature	C or F	0	16-bit signed
8 9	Effective Trace Current	A	1	16-bit unsigned
10 11	Ground Fault Current	mA	0	16-bit unsigned
12 13	Trace Voltage	V	1	16-bit unsigned
14	Output Duty Cycle	%	0	8-bit unsigned

1.1.1.3 Output Data Packet

Byte Offset	Information Conveyed	Units	Decimal Places	Data Format
0 1	Control Setpoint	C or F	0	16-bit signed
2	Control Mode	None	0	Enumeration ¹
3	Control Output	None	0	Enumeration ²

¹ See section 1.1.4 for enumeration values

² See section 1.1.5 for enumeration values

1.1.2 Single Phase with Safety Limiter (4020i-LIM)

This section describes expected configuration data unit, input and output data packets for a Single Phase Elexant unit (4020i-LIM) with a Safety Limiter.

1.1.2.1 Expected Configuration Data Unit

Profibus data expected each configuration data unit for a Single Phase with Safety Limiter unit is in the form of:
0xC0 0x83 0x93 – 4 bytes output data, 20 bytes input data

1.1.2.2 Input Data Packet

Byte Offset	Information Conveyed	Units	Decimal Places	Data Format
0 1	Temperature of Temperature Sensor 1	C or F	0	16-bit signed
2 3	Temperature of Temperature Sensor 2	C or F	0	16-bit signed
4 5	Temperature of Temperature Sensor 3	C or F	0	16-bit signed
6 7	Control Temperature	C or F	0	16-bit signed
8 9	Effective Trace Current	A	1	16-bit unsigned
10 11	Ground Fault Current	mA	0	16-bit unsigned
12 13	Trace Voltage	V	1	16-bit unsigned
14 15	Safety Limiter RTD Temperature	C or F	0	16-bit signed
16 17	Safety Limiter Setpoint	C or F	1	16-bit signed
18	Safety Limiter Relay Status	Open Close	0	Boolean
19	Output Duty Cycle	%	0	8-bit unsigned

1.1.2.3 Output Data Packet

Byte Offset	Information Conveyed	Units	Decimal Places	Data Format
0 1	Control Setpoint	C or F	0	16-bit signed
2	Control Mode	None	0	Enumeration ¹
3	Control Output	None	0	Enumeration ²

¹ See section 1.1.4 for enumeration values

² See section 1.1.5 for enumeration values

1.1.3 Three Phase without Safety Limiter (4020i-3PH)

This section describes expected configuration data unit, input and output data packets for a Three Phase Elexant unit (4020i-3PH) without a Safety Limiter.

1.1.3.1 Expected Configuration Data Unit

Profibus data expected each configuration data unit for a Single Phase with Safety Limiter unit is in the form of:
0xC0 0x83 0x93 – 4 bytes output data, 20 bytes input data

1.1.3.2 Input Data Packet

Byte Offset	Information Conveyed	Units	Decimal Places	Data Format
0 1	Temperature of Temperature Sensor 1	C or F	0	16-bit signed
2 3	Temperature of Temperature Sensor 2	C or F	0	16-bit signed
4 5	Temperature of Temperature Sensor 3	C or F	0	16-bit signed
6 7	Control Temperature	C or F	0	16-bit signed
8 9	Effective Trace Current, Line 1	A	1	16-bit unsigned
10 11	Effective Trace Current, Line 2	A	1	16-bit unsigned
12 13	Effective Trace Current, Line 3	A	1	16-bit unsigned
14 15	Ground Fault Current	mA	0	16-bit unsigned
16 17	Trace Voltage	V	1	16-bit unsigned
18	Output Duty Cycle	%	0	8-bit unsigned

1.1.3.3 Output Data Packet

Byte Offset	Information Conveyed	Units	Decimal Places	Data Format
0 1	Control Setpoint	C or F	0	16-bit signed
2	Control Mode	None	0	Enumeration ¹
3	Control Output	None	0	Enumeration ²

¹ See section 1.1.4 for enumeration values

² See section 1.1.5 for enumeration values

1.1.4 Control Mode Enumeration

This section enumerates the Control Modes for the Elexant (4020i) unit.

Value	Control Mode
0	ON/OFF
1	PASC
2	Proportional
3	Always On
4	Always Off

1.1.5 Control Output Enumeration

This section enumerates the Control Outputs for the Elexant (4020i) unit.

Value	Control Mode
0	Contactor
1	SSR
2	Analog SSR

1.2 Parameterization Vendor Specific Data

The following settings are included within the vendor specific portion of the parameterization data packet.

Position	Information Conveyed	Possible Values
Byte 0, bit 0	Data Format for 16-bit values	0 – Intel Format 1 – Motorola Format
Byte 0, bit 1	Temperature Units	0 – Celsius 1 – Fahrenheit

1.3 Diagnostic Vendor Specific Data

The following items are included within vendor specific portion of the diagnostic data packet.

1.3.1 Diagnostic Alarm Data – Single Phase without Safety Limiter (4020i)

Description	Bit position
Control Temperature Failure	8
Temperature Sensor 1 Failure	9
Temperature Sensor 2 Failure	10
Temperature Sensor 3 Failure	11
Control Temperature High	12
Temperature Sensor 1 High	13
Temperature Sensor 2 High	14
Temperature Sensor 3 High	15
Control Temperature Low	16
Temperature Sensor 1 Low	17
Temperature Sensor 2 Low	18
Temperature Sensor 3 Low	19
High Trace Current	20
Reserved	21
Reserved	22
Low Trace Current	23
Reserved	24
Reserved	25
High Tracing Resistance	26
Reserved	27
Reserved	28
Low Tracing Resistance	29
Reserved	30
Reserved	31
High Voltage	32
Low Voltage	33
High Ground Fault Current	34
Ground Fault Trip	35
Ground Fault CT Failure	36
High Limit Cutout	37
Low Limit Cutout	38
Output Limiting	39

Description	Bit position
Circuit Breaker Limiting	40
Switch Limiting	41
Switch Failure	42
Reserved	43
Reserved	44
Over-current Trip	45
Reserved	46
Reserved	47
EXT Input	48
Reserved	49
Reserved	50
Reserved	51
Reserved	52
Device Reset	53
User Configuration Data Lost	54
User Profile 1 Lost	55
User Profile 2 Lost	56
Factory Configuration Data Lost	57
Maintenance Data Lost	58
Load Shed Source Failure	59
Contactor Cycle Count	60
Heater Time	61
Low EEPROM Pages	62

1.3.2 Diagnostic Alarm Data – Single Phase with Safety Limiter (4020i-LIM)

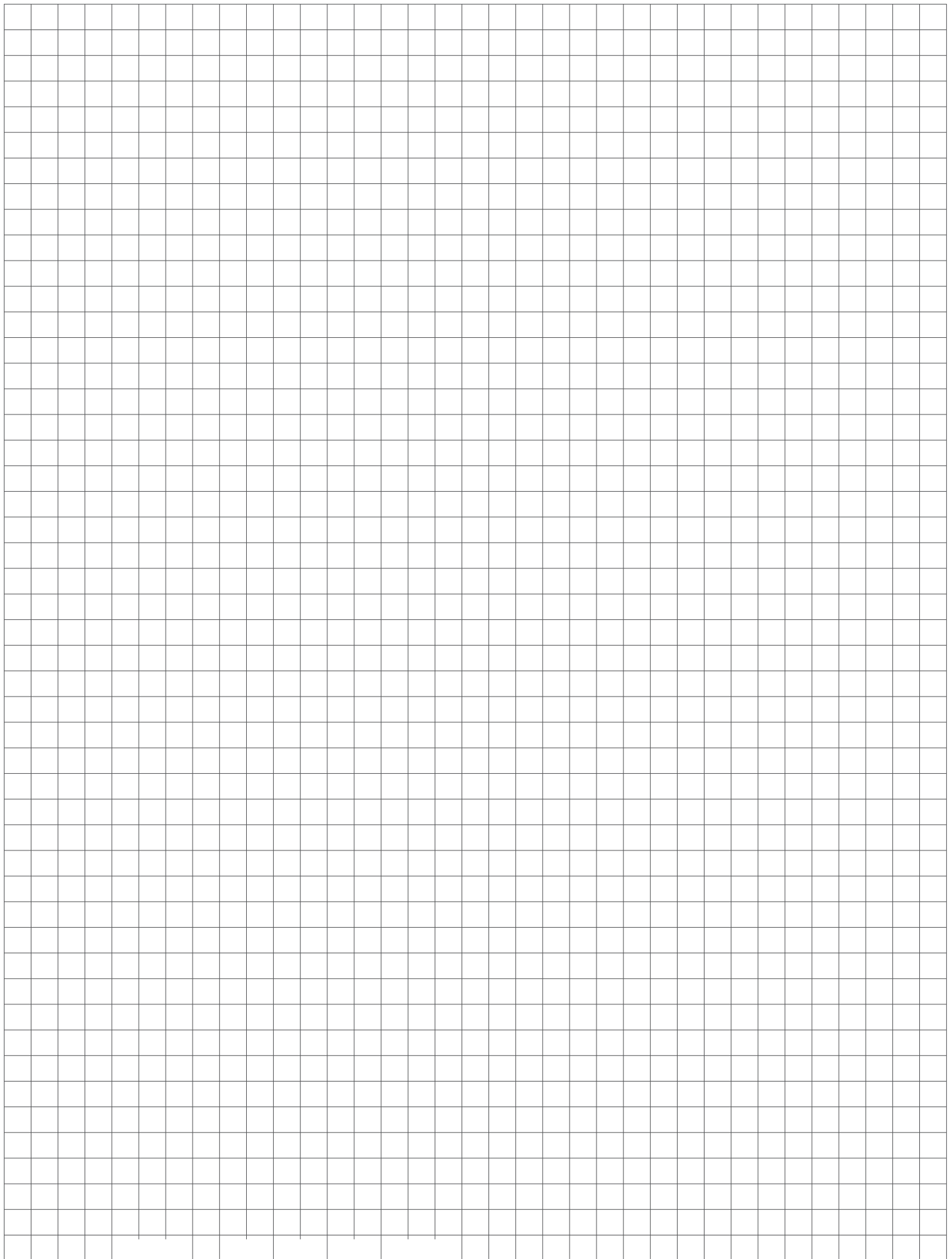
Description	Bit position
Control Temperature Failure	8
Temperature Sensor 1 Failure	9
Temperature Sensor 2 Failure	10
Temperature Sensor 3 Failure	11
Control Temperature High	12
Temperature Sensor 1 High	13
Temperature Sensor 2 High	14
Temperature Sensor 3 High	15
Control Temperature Low	16
Temperature Sensor 1 Low	17
Temperature Sensor 2 Low	18
Temperature Sensor 3 Low	19
High Trace Current	20
Reserved	21
Reserved	22
Low Trace Current	23
Reserved	24
Reserved	25
High Tracing Resistance	26
Reserved	27

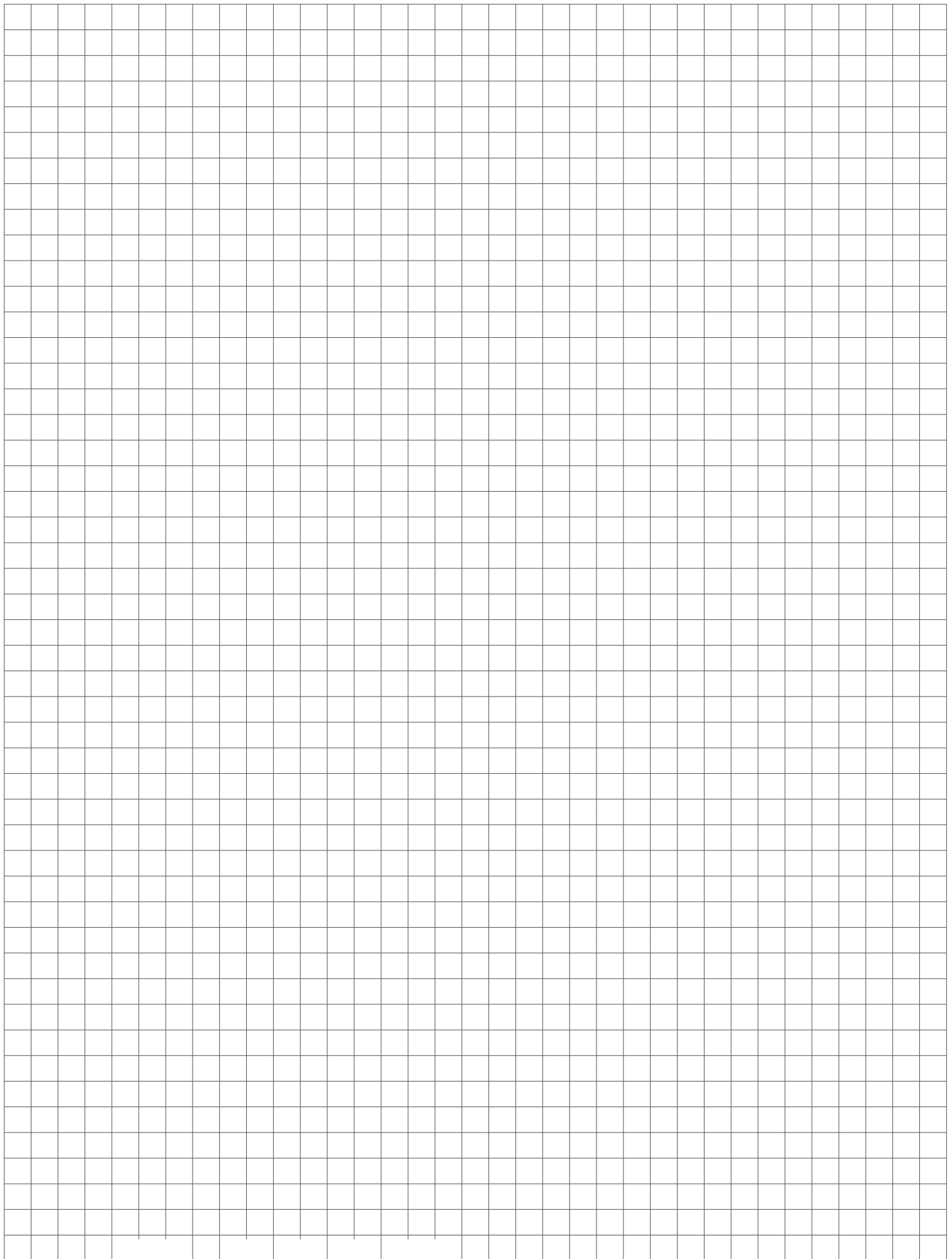
Description	Bit position
Reserved	28
Low Tracing Resistance	29
Reserved	30
Reserved	31
High Voltage	32
Low Voltage	33
High Ground Fault Current	34
Ground Fault Trip	35
Ground Fault CT Failure	36
High Limit Cutout	37
Low Limit Cutout	38
Output Limiting	39
Circuit Breaker Limiting	40
Switch Limiting	41
Switch Failure	42
Reserved	43
Reserved	44
Over-current Trip	45
Reserved	46
Reserved	47
EXT Input	48
Safety Limiter Tripped	49
Safety Limiter Communication Failure	50
Safety Limiter Temperature Sensor Failure	51
Safety Limiter Memory Failure	52
Device Reset	53
User Configuration Data Lost	54
User Profile 1 Lost	55
User Profile 2 Lost	56
Factory Configuration Data Lost	57
Maintenance Data Lost	58
Load Shed Source Failure	59
Contactor Cycle Count	60
Heater Time	61
Low EEPROM Pages	62

1.3.3 Diagnostic Alarm Data – Three Phase without Safety Limiter (4020i-3PH)

Description	Bit position
Control Temperature Failure	8
Temperature Sensor 1 Failure	9
Temperature Sensor 2 Failure	10
Temperature Sensor 3 Failure	11
Control Temperature High	12
Temperature Sensor 1 High	13
Temperature Sensor 2 High	14
Temperature Sensor 3 High	15
Control Temperature Low	16
Temperature Sensor 1 Low	17
Temperature Sensor 2 Low	18
Temperature Sensor 3 Low	19
High Trace Current, Line 1	20
High Trace Current, Line 2	21
High Trace Current, Line 3	22
Low Trace Current, Line 1	23
Low Trace Current, Line 2	24
Low Trace Current, Line 3	25
High Tracing Resistance, Line 1	26
High Tracing Resistance, Line 2	27
High Tracing Resistance, Line 3	28
Low Tracing Resistance, Line 1	29
Low Tracing Resistance, Line 2	30
Low Tracing Resistance, Line 3	31
High Voltage	32
Low Voltage	33
High Ground Fault Current	34
Ground Fault Trip	35
Ground Fault CT Failure	36
High Limit Cutout	37
Low Limit Cutout	38
Output Limiting	39
Circuit Breaker Limiting	40
Switch Limiting	41
Switch Failure, Line 1	42
Switch Failure, Line 2	43
Switch Failure, Line 3	44
Over-current Trip, Line 1	45
Over-current Trip, Line 2	46
Over-current Trip, Line 3	47
EXT Input	48
Reserved	49
Reserved	50
Reserved	51
Reserved	52
Device Reset	53

Description	Bit position
User Configuration Data Lost	54
User Profile 1 Lost	55
User Profile 2 Lost	56
Factory Configuration Data Lost	57
Maintenance Data Lost	58
Load Shed Source Failure	59
Contactor Cycle Count	60
Heater Time	61
Low EEPROM Pages	62





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