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Grain and oil storage - Monitoring and control system of stored-grain condition - Part 4: Information exchange interface protocol

粮油储藏 粮情测控系统 第4部分:信息交换接口协议

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1 Scope

This document specifies the communication mode and the information exchange mode of the information exchange interface protocol for stored-grain condition monitoring and control, together with the requirements for the interface definitions.

This document applies to the design and construction of the information exchange system of a stored-grain condition monitoring and control system.

2 Normative references

The contents of the following document constitute indispensable provisions of this document through the normative reference made to it in the text. For dated references, only the edition corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies.

LS/T 1802-2016 Data elements for grain storage operations.

3 Terms and definitions

The following term and definition apply to this document.

3.1 data exchange interface: a set of conventions laid down between different systems in order to accomplish the exchange of data.

Note: in a stored-grain condition monitoring and control system, the data exchange interface is responsible for the calling of the data resources of the stored-grain condition

monitoring and control system and of the grain and oil warehouse management information system, for carrying those calls out and for returning the result sets. The two systems reach each other's data through the request methods of this interface, and the system addressed provides the response service.

4.1 Communication mode between the host computer and the outstations

The communication modes between the host computer and the outstations of a stored-grain condition monitoring and control system are as follows: a) the host computer sends a read command or a control command to an outstation; b) the outstation answers the host computer command, returning the corresponding data or carrying out the corresponding control action.

4.2 Information exchange mode of the stored-grain condition monitoring and control system

The information exchange modes of the stored-grain condition monitoring and control system are as follows: a) the stored-grain condition monitoring and control system and the grain and oil warehouse management information system request a service from one another and call the other party's service interface; b) the stored-grain condition monitoring and control system or the grain and oil warehouse management information system answers the request and returns to the other party structured data packaged in a data set.

5.1.1 Byte transmission format

A serial port shall be configured as follows: a) 1 start bit; b) 8 data bits; c) no parity bit; d) 1 stop bit; e) a baud rate in bit/s, the values of which include but are not limited to 1200, 4800 and 9600.

The Ethernet configuration is as follows. a) The internet protocol (IP) address of the server is set in the same network segment as the IP address of the monitoring and control outstation. b) The transmission control protocol (TCP) port of the server is 1238 and the user datagram protocol (UDP) port is 1240. c) The server sends the various query commands as a UDP broadcast, with destination IP 255.255.255.255 and destination port 5000. d) The monitoring and control outstation returns data over TCP, the TCP port of the outstation being 3000.

The data frame format of the communication interface shall conform to Table 1. The frame carries, in order, the start delimiter 55H AAH 55H AAH of 4 bytes, the outstation address KADDL of 1 byte, the control character Command of 1 byte, the data length Length of 2 bytes, the data segment DataSegment of length L, the CRC-16 check of 2 bytes and the end delimiter 16H E9H 16H E9H of 4 bytes. The CRC-16 check is computed over all the

data from the start delimiter up to the check field.

The command response time shall be not more than 200 ms. Note: the command response time is the time from the end of the sending of the command to the receipt of the first byte of the data returned by the outstation.

5.1.2 Communication formats

The command with which the host computer reads the status of an outstation is sent in the format of Table 2, with Command = A0H and Length = 0000H, and the outstation returns the status data in the format of Table 3, with Command = 80H and Length = 0002H, State being the status data segment and occupying two bytes.

The command with which the host computer reads the temperature and humidity outside the store is sent in the format of Table 4, with Command = A1H and Length = 0000H, and the outstation returns the data in the format of Table 5, with Command = 81H and Length = 0004H. Cwtl, Cwth, Cwsl and Cwsh together make up the data segment: Cwtl and Cwth are the temperature outside the store, Cwtl being the low byte and Cwth the high byte, while Cwsl and Cwsh are the humidity outside the store, Cwsl being the low byte and Cwsh the high byte.

The command with which the host computer reads the temperature and humidity inside the store is sent in the format of Table 6, with Command = A2H and Length = 0000H, and the outstation returns the data in the format of Table 7, with Command = 82H. CntNl and CntNh are the value of the Nth temperature measuring point inside the store and CnsNl and CnsNh the value of the Nth humidity measuring point, in each pair the first being the low byte and the second the high byte.

The command with which the host computer reads grain bulk temperature is sent in the format of Table 8, with Command = A3H and Length = 0000H, and the outstation returns the data in the format of Table 9 or of Table 10. In the first of these formats Command = 53H, Ln is the number of the nth sensor cable and is two bytes long, and Tnl and Tnh are the value of the nth measuring point on a given cable, the measuring points of one cable being ordered from top to bottom, Tnl being the low byte and Tnh the high byte. In the second format Command = 83H, and Tnl and Tnh are the value of the nth temperature measuring point of a given store.

The command with which the host computer reads the stored-grain insect pest information of a store is sent in the format of Table 11, with Command = A4H and the pest measuring point number given as xxxxH, and the outstation returns the data in the format of Table 12, with Command = 84H. In the returned data, In records that an insect fell into pest measuring point m of a given store at the instant In; it is 7 bytes long and has the same format as the first seven bytes of the DS1307 time. If the number of insect falls is zero, the fields I0 to In are absent.

Other stored-grain condition information is read with the command format of Table 13, in which Command takes values from A5H to BFH, one command control character being used for each kind of stored-grain condition information, and Length = 0000H. The outstation returns the data in the format of Table 14, in which Command takes values from 85H to 9FH on the same principle, and Xnl and Xnh are the value of the nth measuring point of that kind of information in a given store, Xnl being the low byte and Xnh the high byte.

5.1.2.7 Calculation formulas for stored-grain condition data

The calculation formulas for stored-grain condition data and the values of the special points are as follows. a) Temperature is calculated as Tnh multiplied by 256, plus Tnl, divided by 10, and is kept to one decimal place. b) Humidity is calculated as Snh multiplied by 256, plus Snl, divided by 10, and is kept to one decimal place. c) Other stored-grain condition data are calculated as Xnh multiplied by 256, plus Xnl, divided by 10, and are kept to one decimal place. d) If a measuring point returns no data this means that there is a fault, an open circuit being reported as 7777H and a short circuit as 8888H. e) A blank point with no sensor takes the value 9999H.

5.1.2.8 Status information of the stored-grain condition control equipment

The command with which the host computer reads the status information of the stored-grain condition control equipment is sent in the format of Table 15, with Command = C1H and Length = 0000H; the outstation returns the data in the format of Table 16, with Command = C2H, ECn being the current status of the nth item of equipment; and the command with which the host computer sets the status of the control equipment is sent in the format of Table 17, with Command = C3H, ECn being the status to which the nth item of equipment is to be set.

5.2.1 Data exchange interfaces provided by the grain and oil warehouse management information system

Seven methods are defined, in each of which the stored-grain condition monitoring and control system is the service requester, the grain and oil warehouse management information system is the service responder and the return type is composite: Get_DepotInfoData for the basic information of the depot, Get_BarnBaseInfoData for the basic information of the barns, Get_SeparateSpaceBaseInfoData for the basic information of the separate storage spaces, Get_GrainInfoData for the stored-grain information of a separate storage space, Get_OiltankInfoData for the basic information of the oil tanks, Get_OilInfoData for the stored-oil information of an oil tank, and Get_CollectionPlanData for the stored-grain condition collection plan.