

## S10 DIGITAL MULTIPLEXER SYSTEM

### 1 INTRODUCTION

- 1.1 The S10 multiplexer system is provided to communicate the status of up to ten individual switch contacts in the hazardous area on one cable pair, to give corresponding individual output signals in the safe area.
- 1.2 The enhanced transmitter S10/HA2 is suitable as a direct replacement for installed models of the earlier S10/HA, and is compatible with S10/SA receivers of all ages. See para. 2.6 below.
- 1.3 The system comprises of the following:-
  - 1.3.1 Hazardous Area Transmitter type S10/HA2, see section 2.
  - 1.3.2 Interconnecting cables, see section 3.
  - 1.3.3 Intrinsically safe interface, see section 4.
  - 1.3.4 Safe Area Receiver type S10/SA, see section 5.

### INSTRUCTIONS FOR INSTALLATION AND OPERATION

#### 2 S10/HA2 HAZARDOUS AREA TRANSMITTER

|                 |                   |               |             |  |
|-----------------|-------------------|---------------|-------------|--|
| <b>S10/HA2:</b> | Baseefa03ATEX0483 | EEx ia IIC T5 | Tamb = 55°C |  II 1 G |
|                 |                   | Ui = 30V      | li = 660mA  | Pi = 1.3W  |

- 2.1 The transmitter is mounted in the hazardous area in a location convenient to accept input connections from up to ten volt-free switch contacts.
- 2.2 It should be mounted in a suitable enclosure to protect it from the local environmental conditions, most usually IP65 if outdoors, although for safety requirements the enclosure need only offer protection to IP20.
- 2.3 A 4-pole removable connector which includes the terminals numbered 21 to 24 inclusive makes connection to the remote interface.
- 2.4 Connection to the field switch contacts is via the 20-pole removable connector carrying the terminals 1 to 20 inclusive. Details of all connections are given in the table in section 6.
- 2.5 For convenience of wiring, it should be noted that the even numbered input terminals from No.2 to No. 20 inclusive are all common 0V, and the groups of switches may employ a common connection taken to any one of these terminals to economise on cable cores where appropriate.
- 2.6 The selection of operating mode (or 'phase') is done at the transmitter terminals 23 & 24. Where the S10/HA2 is being used to replace an earlier S10/HA unit, then these terminals are left free of connections and the receiver outputs are energised while the field switches are open. In this mode, unused switch input terminals must be bridged with a link. The opposite phase, which is equivalent to the traditional 'failsafe' operation of a normally-closed field switch, is obtained by linking together terminals 23 & 24 on the transmitter. Any unused switch input terminals are left free of connection.
- 2.7 Some unusual installations may involve the need to change the switching mode as an operational function. For this reason, a barrier connection to transmitter terminals 23 & 24 is permitted in the approved system and barrier type S933 or S936 may be suitable.

### **3 INTERCONNECTING CABLES**

- 3.1 The cable connecting the transmitter to the interface comprises only two cores, carrying both power and data on the same pair.
- 3.2 The pair does not normally need to be screened, although if it is contained within a multipair cable carrying other intrinsically safe circuits then screened pairs are recommended, especially if the other pairs in the cable include further multiplexer systems.
- 3.3 To ensure that the limiting reactance parameters are not exceeded, a maximum conductor size of 0.5mm<sup>2</sup> in Group IIC is recommended. In Group IIB, cables of 1.5mm<sup>2</sup> may be used.

### **4 ZENER BARRIER OR ISOLATION INTERFACE**

- 4.1 The intrinsically safe interface may comprise one of the following:-
  - 4.1.1 One single or double channel zener barrier having total output parameters not exceeding  $U_z = 30V$ ,  $I_o = 600mA$  and  $P_o = 1.3W$ . While these parameters offer an extremely wide choice, from an operational point of view optimum working conditions will be afforded by an interface rated in the region of  $U_z = 15$  to  $18V$  and  $I_o = 130$  to  $300mA$ , connected to the transmitter terminals 21 & 22. All barriers are of the positive polarised type.
  - 4.1.2 Single channel zener barriers are normally connected positive to transmitter terminal 22 with grounded return from terminal 21. Where it is preferred that the return line is not grounded at the barrier then an additional diode return channel may be used, which must have a voltage rating  $U_z$  not exceeding that of the principal resistive barrier channel. RTK double-channel type S936 is recommended.
  - 4.1.3 One RTK isolation interface type E1520 (ATEX certification pending).
- 4.2 The interface should be located within the non-hazardous (safe) area, at a point as close as practicable to the point at which the wires to the transmitter pass into the hazardous area.

## 5 S10/SA SAFE AREA RECEIVER

- 5.1 The receiver is mounted where convenient in the safe area.
- 5.2 The receiver requires a supply of between 22 and 30VDC . Where all LED output options (see 5.4) are in use, the current demand will be up to 250mA. If the LED outputs are not used, then a supply capacity of 150mA is adequate. Note that if early models of S10/SA (pre-1993) are in use, then the current demand is increased by about 100mA.
- 5.3 Principal outputs to the control system are in the form of one volt-free changeover contact set for each of the ten switch channels. The switching capacity of 1A at 30VDC or 110VAC resistive must not be exceeded.
- 5.4 Secondary outputs are provided to drive LEDs to indicate the status of each channel on an associated panel.  
Each LED is energised from a supply of approximately 22.5V (while  $V_s = 24V$ ) via a resistor of 2K0, giving a current of 10mA approximately into a single LED element. If required, additional LEDs may be connected in series at each output with a corresponding reduction in current according to the number of LEDs used.  
Some reduction in wiring to the LED panel can be realised by taking advantage of the fact that LED positive terminals 2, 7, 12 etc. are common and only one conductor needs to be used to serve multiple positive LED connections.
- 5.5 Further outputs are provided from the watchdog circuitry in the form of a changeover contact set and LED output having the same characteristics as the channel outputs 5.3 and 5.4 above.  
The fault relay is normally energised, dropping out to the N/C contact in the event of a fault. The fault LED output is normally energised while healthy, being extinguished in the event of a fault. When a fault occurs, the channel outputs will normally remain in the status which existed immediately prior to the incidence of fault.
- 5.6 As with the transmitter, all connections are made via removable terminal blocks. Full details of individual connections are tabulated in section 6.
- 5.7 When the LED outputs at the receiver are in use, a lamp test facility is available. A switch is connected across terminals 55 and 56 which, when closed, will energise all the LED outputs. Operation of this facility does not interfere with the principal outputs at the relay contacts.

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 INSTRUMENTS

## 6 CONNECTION DETAILS

| CHANNEL NO.      | S10/HA2 SWITCH INPUT TERMINALS  |     | S10/SA RECEIVER OUTPUT TERMINALS |    |                  |     |     |
|------------------|---------------------------------|-----|----------------------------------|----|------------------|-----|-----|
|                  | +                               | -   | LED                              |    | CONTACTS         |     |     |
| 1                | 1                               | 2   | -                                | +  | N/O              | COM | N/C |
| 2                | 3                               | 4   | 21                               | 22 | 23               | 24  | 25  |
| 3                | 5                               | 6   | 16                               | 17 | 18               | 19  | 20  |
| 4                | 7                               | 8   | 11                               | 12 | 13               | 14  | 15  |
| 5                | 9                               | 10  | 6                                | 7  | 8                | 9   | 10  |
| 6                | 11                              | 12  | 1                                | 2  | 3                | 4   | 5   |
| 7                | 13                              | 14  | 26                               | 27 | 28               | 29  | 30  |
| 8                | 15                              | 16  | 46                               | 47 | 48               | 49  | 50  |
| 9                | 17                              | 18  | 41                               | 42 | 43               | 44  | 45  |
| 10               | 19                              | 20  | 36                               | 37 | 38               | 39  | 40  |
| 10               | 19                              | 20  | 31                               | 32 | 33               | 34  | 35  |
| <b>FAULT</b>     | S10/SA Output                   |     | 60                               | 61 | 57               | 58  | 59  |
|                  | S10/HA2 Terminals               |     |                                  |    | S10/SA Terminals |     |     |
| <b>MODE</b>      | 23-                             | 24+ | LINK FOR 'FAILSAFE' MODE         |    |                  |     |     |
| <b>DATA</b>      | 21-                             | 22+ | VIA INTERFACE                    |    |                  | 51- | 52+ |
| <b>POWER</b>     |                                 |     | SUPPLY 22-30V DC                 |    |                  | 53- | 54+ |
| <b>LAMP TEST</b> | CONNECT SWITCH ACROSS TERMINALS |     |                                  |    | 55-              | 56+ |     |

## 7 MARKING DETAILS

