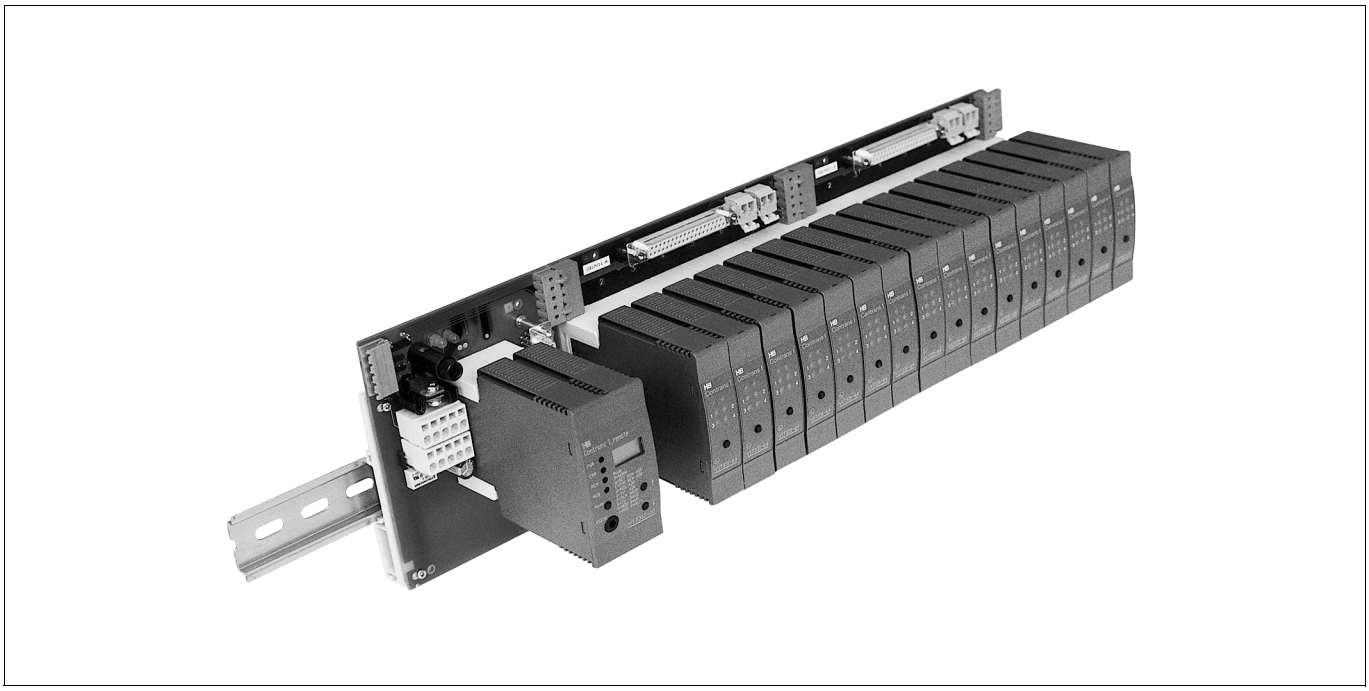

- **Bus-capable input/output modules for moúnting in sub-distribution box or switching cabinet**
- **Direct or redundant coupling to ever DCS or PLC via exchangeable gateways**
- **Compatible with existing intelligent sensors and actuators**
- **Reduced service and installation costs through well-outlined instrumentation with pluggable modules**
- **Economical even with reduced number of channels**
- **High operation safety and availability, including high disturbance immunity**
- **Automatic self-monitoring and error diagnostics**
- **Enhanced system accuracy through digital transmission alarm signalling units**

Introduction

In the field of automation and process engineering, required field signals have to be often collected from far-strewn subplants. With the conventional point-to-point wiring technique, which as a rule involves the transmission of signals via 2 lines, long lengths of cable and a lot of distribution boxes and marshalling unit are required.

Often than not the functionality of the input and output modules of PLC's or DCS are insufficient, an additional signal matching level becomes necessary. This could be the case, for instance, when transmitter power supply, electrical isolation, impedance surges or intrinsically safe signal circuits for hazardous areas are indispensable. It is especially for such cases the company has developed the process interface program Contrans I (Catalog 17.1 EN). In order to reduce the planning and wiring expenditure, pre-wired module racks for 16 plugable function modules have been provided. The power is supply centrally. A system cable with plug-in terminals at both ends enables the direct connection of all modules to the input/output modules of the control unit.

The consequent development of the above module racks to an open field bus system has produced the product program **Contrans I_remote**, described in the present Catalog 17.2 EN. All input and output modules have a bus-capable design, which enables connection via a bus coupler with the open field bus.

Thanks to the modular design and the easy matching to the applied field bus protocol, Contrans I_remote is a flexible extension of the I/O level for your DCS/PLC. The planning and wiring expenditure is greatly reduced. Furthermore, marshalling, input and output modules of the control unit become unnecessary and these features make substantial savings possible.

Description

Contrans I_remote provides all the necessary modules for matching the field signal. These include analog inputs for feeding the transmitter or for reading off analog field signals, temperature inputs, analog outputs for controlling electrical actuators and positioners, binary input and output units.

In every Contrans I_remote module, field signals are amplified, electrically isolated and converted in a CI-internal bus with the help of a micro-controller. The gateway communicates with the modules (Fig. 1) by way of this serial bus.

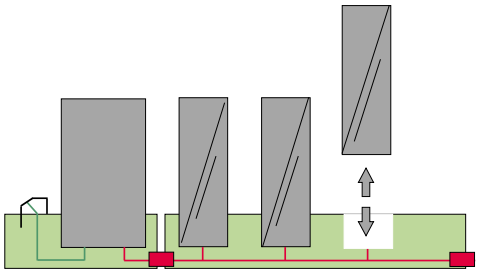

Fig. 1: Functional diagram of a Contrans I-remote stand-alone unit (extendable up to 125 modules per unit)

The gateway takes over the conversion of the signals sent to it in a standardized field bus protocol. The higher-level distributed control system or controllers communicate via this external field bus with the gateways. Every gateway contains a complete process diagram of all connected field signals.

The wiring in the sub-transmission box or switching cabinet is effected with the help of backplanes which can be snap-fitted onto DIN mounting rails (Fig. 2). The multi-channel backplanes contain the field unit terminals and special slots for the function modules. The field signals can be allignedin any order, since the functionality is later determined by the pinout of the respective module. The marshalling, i.e. the assignment of the field signals is later accomplished per software. Power supply and the internal bus signal are further transmitted by means of laterally positioned connectors. A further backplane carries the gateway with the bus plug. The power terminal module takes care of the power supply of the Contrans I_remote stand-alone unit.

Up to 125 1-, 2- or 4-channel modules can thus be connected to the gateway. Gateways and the post-connected function modules represented a node. More higher number of subscribers can be obtained by assembling further Contrans I_remote nodes. The cycle time for the internal serial bus is 20 ms for 400 binary signals or 50 ms for 100 analog signals.

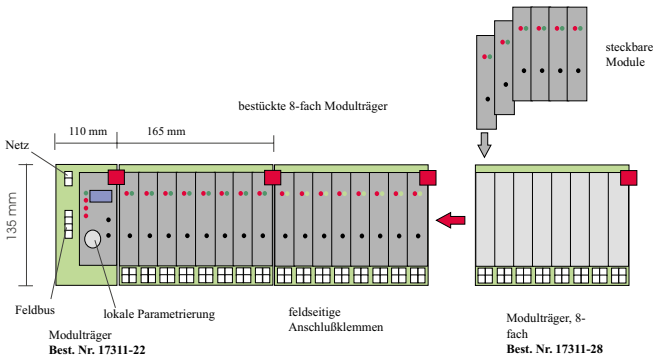

Fig. 2: Schematic setup of Contrans I_remote

The number of nodes (gateway), the bus length and cycle time of the external bus structure depend on the bus system used. Each Contrans I_remote gateway stands for one subscriber (Fig. 3). Bigger distances and greater numbers of subscribers are possible with FOC's and repeaters.

Technical characteristics

Bus-cabable input and output modules. Contrans I-remote provides a platform for galvanically separating signal processing components. Among these are analog modules for feeding intelligent transmitters, for measuring temperature and for controlling actuators such as positioners or servodrives. Switch amplifiers for proximity switches to EN 50227 (NAMUR) or transistor inputs are used to process binary input signals. Binary outputs are relay modules or are used in intrinsically safe applications as solenoid drivers for feeding and controlling intrinsically safe solenoid valves. All module types are also available in intrinsically safe versions. Modules with or without intrinsic safety can be operated on a gateway.

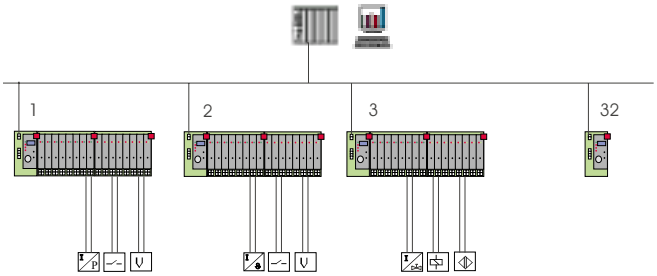

Fig. 3: Interconnection of Contrans I_remote

Direct coupling of PLC or DCS to any bus system. the modular system structure of Contrans I_remote enables easy matching ot any desired field bus protocol. The gateway is here the link between the input and output modules and the PLC or DCS. It takes over the transfer of the internal bus protocol of the input and output modules into the external bus protocol. This ensures the direct coupling to the bus system used for PLC and DCS. Later matching of the field bus protocol to future standards becomes easy by just changing the gateway. Already provided are link-up possibilities for PROFIBUS-DP and Modbus.

Compatibility with existing intelligent sensors and actuators. All important measured variables and error states of existing field units using the HART protocol can be processed with Contrans I_remote modules for analog signals. This is also possible for the FSK bus (Fig. 4). With this possibility, a system-wide consistency is achieved right to the sensor and actuator level, enabling the complete functional volume of the smart multifunctional units of the PC to be directly evaluated. Apart from the internal parameters, almost all intelligent sensors and actuators supply other additional parameters. For example, intelligent positioners have end-position feedback and position feedback signals, which can also be called up in addition to the output signal. Of course the entire parameter settings of the field units can also be conducted via the Contrans I_remote modules with the support of a PC human interface. A point to point communication via handheld terminal is also possible.

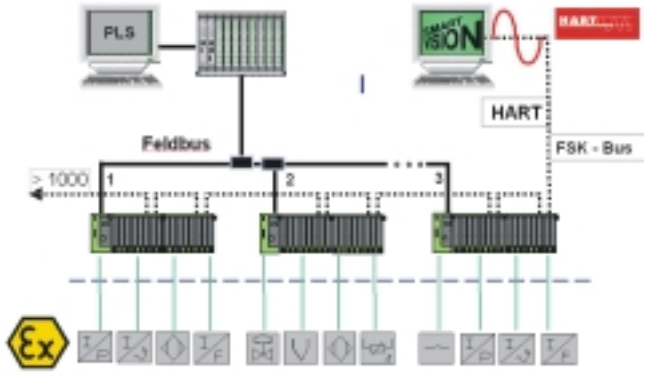

Fig. 4: Communication via HART protocol and FSK bus

Reduced service and installation costs. During installation, the wiring is done on backplanes which are snap-fitted onto DIN mounting rails. The required functional module is then plugged into the socket at the appropriate place. Since the module itself does not contain any wiring elements, the entire wiring can only be done with the help of a module rack, without a module. This greatly simplifies the mounting exercise, since the modules are matched to the wiring and vice-versa. Wiring errors are avoided, thanks to the well-outlined and systematic terminal layout.

The front-panel LED's on the modules for power supply, communication, error and switching states make commissioning and servicing easy. Since all nodes can be commissioned independently of each other, the system structure remains simple and clear-cut.

The modules are configured by means of SMART VISION_remote. This software package, which runs under Windows, was developed according to the GMA guidelines. During initial installation, each added module is integrated into the cyclical data inter-rogation feature of the gateway after being assigned with an adress.

The gateway permanently provides a copy of all module configurations. Eventual module faults are recognized and signalled to the higher-level system. All it takes is to plug a subsitute module with the bus adress 0 in place of the defective one. The bus link recognizes the module change and assigns the exchanged module to the parameter configuration of the defective module. Manual parameter configuration is not necessary, the amount of work required in case of servicing is reduced to a minimum. On top of that, no system knowledge is required. The distribution of addresses and other simple basic functions can be undertaken at easy without a PC, via the locally provided manual control elements of the gateway.

Module exchange without disturbing bus operation and without undoing the wiring. The plug-in module design dispenses completely with wiring elements. To exchange modules, there is therefore no need to undo the wiring. All modules can be exchanged without disturbing the bus operation, since the internal bus is not interrupted during the module exchange.

Cost-saving. The special requirements made on the signal conditioning can only be fulfilled in several areas of process engineering with the help of separate interface modules. The work involved in such an exercise can be greatly reduced by using the field bus technique, i.e. by shifting the functionalities to the field. Owing to the timely digitalization of the field signals, the input and output modules of the PLC and DCS become unnecessary. Besides saving space in the control room, work and expenditure for wiring are greatly reduced.

The classical point-to-point wiring is only necessary between the input and output modules mounted in the sub-distributor and the sensors for actuators respectively. In contrast to that, the point-to-point wiring of the control sections and the complicated routing through the field bus become superflous. With the absence of complete wiring, the risk of wrong wiring during the commissioning phase is greatly reduced. Altogether, the planning and documentation work required by conventional transmission technology also becomes greatly simplified.

The input and output modules of Contrans I_remote can also be used as an Ex-isolating point when it comes to applications in hazardous areas.

Also cost-effective for a reduced number of channels. The low channel input and output modules can be plugged in any sequential order. This ensures optimal matching of the required channels to the number of channels really required. Multi-wired trunk cables can be directly assigned to the input and output modules without having to sort out the signal lines before that. A separate terminal connection is no longer required, because the trunk cable can be directly connected to the terminals of the standard socket.

High operation safety and interference immunity. The sensors and actuators to be connected are supplied with power directly from the modules. The wiring of a separate power supply unit is therefore not required. The highest possible degree of safety and interference immunity are guaranteed by the short-circuit-free inputs and outputs which are galvanically separated from bus and power supply.

Contrans I_remote has a sophisticated redundancy concept. if need be, every node can be also equipped with an additional gateway, in order to establish a redundant connection to the DCS. The additional gateway permanently monitors the function of the first bus and takes over control, if need be. Further, a failure of the centrally supplied power is signalled back via a relay. Redundant power supply is also possible.

Enhanced system accuracy. The accuracy of conventional current circuits is impaired by converters in ex-buffer stages or I/O modules, as well as by external interferences. With Contrans I_remote, contrary to this classical transmission technique, the field signals are already digitalized in the field and further transmitted to the higher-level system, free of falsification.