CONTROLLERS DATASHEET

DF75
HSE Controller

Modbus

FOUNDATION HART COMMUNICATION PROTOCOL Modbus

smar
Technology Company

DF75 HSE Controller

TECHNICAL INFORMATION

Product Description

DF75 module is the second generation of Smar Logic Controller including 2 Ethernet ports for HSE protocol and capability of FOUNDATION Fieldbus block execution. DF75 is a HSE Field Device whose main purpose is the discrete control associated with continuous control through the use of FOUNDATION Fieldbus Blocks. Through the I/O cards, it is possible to execute the discrete control via relay diagram logic (Ladder Diagram). Besides that DF75 has two Ethernet ports that guarantee high availability of control and supervision. DF75 also have redundant operation, giving higher availability security level for industrial process.

Main Characteristics

Functionalities:

- HSE Field Device
- Modbus Gateway (serial and TCP/IP)
- Ethernet connectivity

Technical Characteristics:

- Two 10/100 Mbps Ethernet ports;
- Support up to 100 FOUNDATION fieldbus function blocks;
- 128 parameters can be linked externally via HSE links;
- Support Flexible Function Block (FFB);
- Discrete control via relay diagram;
- Access to I/O modules;
- Webserver;
- Modbus Gateway;
- Redundant operation;
- Real Time Clock (RTC) and watchdog;
- Supervision for up to 2000 points per second;
- It supports up to 16 HART modules (DF116/DF117).

Available Memory:

Volatile Memory	8 Mbytes
Non Volatile Memory *	4 Mbytes
EEPROM	1 kbyte
Flash to the program	4 Mbytes
Flash to monitor	2 Mbytes

* It is kept by not rechargeable internal battery.

Continuous Control with Foundation Fieldbus

The DF75 module is a HSE Field Device, with block execution capability. It has up to 100 blocks, including a Flexible Function Block to link Foundation Fieldbus control strategies with Ladder. Through configuration tools available in the System302, as the Studio302 and Syscon, it is possible to configure the DF75 completely.

Discrete Control

DF75 module also has the capability of access I/O cards through the IMB (Inter-Module Bus), present in the backplane where the DF75 is mounted. Through the IMB, up to 15 racks can be interconnected, each one having up to 4 cards. If there is a redundant controller is necessary the use of rack DF78 or DF92. If DF78 is used plus 16 racks DF1A can be added. If DF92 is used plus 16 racks DF93 can be used. Additional power supplies in others racks can be necessary depending on the load of the cards.

DF Line of I/O cards that can be used:

Digital inputs and outputs
Analog inputs and outputs*
Temperature
Pulse counting

The user program is developed using relay diagrams (IEC-61131-3), through the LogicView for FFB tool, available on System302. The LogicView for FFB is a complete development environment, allowing the user to create, edit, simulate and supervise the developed application. The interconnection with fieldbus is made through a flexible function block.

General Characteristics of the discrete control in the DF75:

I/O Points *	1024 discrete points or 512 analog (maximum)
Auxiliary Points	Maximum of 4096 points
Ladder Function Blocks	Maximum of 2000 blocks**
Configuration File	Maximum 120 kbytes **
Program Execution Cycle for 1000 boolean operations (without redundancy)	10 ms (minimum)*** 32 ms (typical)****
Program Execution Cycle with redundancy	Increment of 10ms (typical)***** up to 50 ms (maximum) to execution cycle
Execution Average Time	1.1 ms/Kbytes of program (minimum) 3.7 ms/Kbytes of program (typical)

* The whole number of points includes inputs and outputs, analog or digitals. Maximum may change according I/O type used.
** 120 Kbytes and 2000 blocks are available in firmware version 2.x and later. Earlier versions limits are 60 Kbytes and 1200 blocks respectively.
*** 1131 Flexible Function Block adjusted to Zero (Very High Priority) and no other function blocks and HSE links are configured. Each 1000 boolean operations allocate 8.6 Kbytes.
**** Total execution time will change depending on the adjusted priority of 1131 FFB. The adjustment should be compatible with the quantity of function blocks and HSE links.
***** The whole execution time may change depending of the configuration file size.

The extensive library of LogicView for FFB function blocks allow the implementation of discrete and/or continuous control.

The complete list can be seen in the LogicView for FFB manual available on the Smar website.

The size of the configuration file and its time of execution can be estimated through a simple addition of the elements that compose the program. The total execution time will be given by the configuration execution time plus the program execution cycle, that is 10ms.

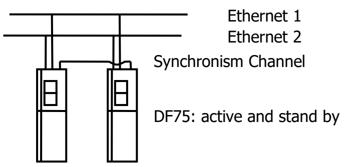
Redundant Operation

DF75 can operate in stand alone (one DF75) or redundant (two DF75) mode. In redundant mode, the two DF75 are capable to communicate through a proprietary channel and change information about configuration and operation status.

Some DF75 elements are redundant:

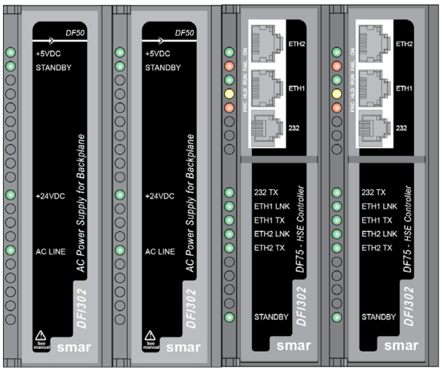
- HSE Block Redundancy
- HSE link Redundancy
- Ladder Redundancy
- Supervision Redundancy
- Ethernet Media Redundancy

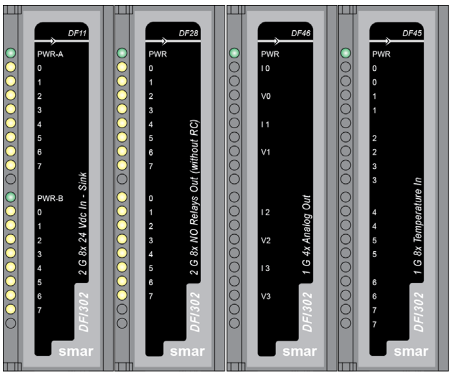
Topology to interconnection of DF75 in redundancy:



Redundancy General Characteristics:

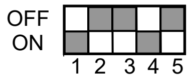
For redundancy of access in I/O cards, it is necessary the use of a special rack (DF78 or DF92). The two power supplies and the two DF75 must be mounted on this rack, in that order. The remaining modules can be interconnected as usually.





Internal Battery

The DF75 Real Time Clock (RTC) and its non volatile RAM (NVRAM) are maintained by a non-chargeable battery when there is lack of external supply. This battery can be either enabled or disabled, depending on the position of the switch 1, in the back part of the DF75. To enable the battery, let the switch 1 as the following picture:



1) Battery ON
2) Keep in this position
3) Simulate
4) Watchdog ON
5) Keep in this position

In this configuration, when there is lack of energy, the RTC and the NVRAM will be supplied by the battery, allowing the retention of all configuration data. In case of equipment storage, it is recommended that the battery is turned off (switch 1 in position OFF).

Battery features:

Type of battery	Battery Panasonic BR-2/3AE2SP - Lithium
Capacity	1200 mAh
Devices maintained by the battery	RTC and NVRAM
Minimum life span	8 years (typical charge of 17uA)
Maximum life span	49 years (typical charge of 2,8uA)
Voltage	3 V (subject to revision when below 2.5 V)

Communication Ports and Channels

Ethernet Port:

Communication rate	10/100 Mbps
Standard	IEEE 802.3u
Isolation	150Vrms
Operation Mode	Full-duplex
Connector	RJ45 with shield*

* Grounded to the rail used for fixing the rack in which the DF75 is installed.

Modbus Port:

Maximum Communication Rate *	115200 bps
Standard	EIA-232
Connector **	RJ12 with shield
Maximum Current ***	0.5A @ 3.3V

*There is an increase in error rate as we increase the communication rate over 19200 bps. In many situations these errors can be acceptable and they are not noticed by supervision.
** Grounded to the rail used for fixing the rack in which the DF75 is installed.
*** Internally protected by solid state fuse.

Redundant Port

Maximum Communication Rate	115200 bps *
Standard	EIA-232
Connector	RJ12 with shield**
Maximum Current***	0.5A @ 3.3V

* Rate for control information. Data traffic through Ethernet.
** Grounded to the rail used for fixing the rack in which the DF75 is installed.
*** Internally protected by solid state fuse.

Failure Relay

Output type	Solid state relay, normally closed (NC), isolated
Maximum Voltage	30 VDC
Maximum Current	200 mA
Overload Protection	Not available. Must be provided externally
Normal Operation	Open contacts
Failure Condition	Closed contacts
Maximum cable length connected to the relay	30m

The power supply for the load must not be from an external network (outside the panel).

IMB Bus

Voltage	5 VDC
Bus	8 bits
Failure Signal	Yes
Hot Swap	Yes
Redundancy in the bus access	Yes, but only using the DF78 or DF92 rack

Module Features:

Controller:

CPU	Family ARM7TDMI
Bus	32bits
Architecture	RISC
Performance	40 MIPS
CPU Cache	8kbytes
Clock	40 MHz
DMA	10 channels
Ethernet	MAC 10/100 integrated
Watchdog	Yes (200ms of cycle)
Operation Voltage	3.3V for I/O

Module:

Operation Voltage	5V (± 5% of tolerance)
Typical Current	550 mA
Real Consumption	2.75 W
Environment Air Temperature (Operation)	0 to 60º C (IEC 1131)
Storage Temperature	-20 to 80º C (IEC 1131)
Relative Air Humidity (Operation)	5% to 95% (non-condensing)
Cooling Mode	Air Convection
Dimensions (HxWxD, mm)	149x40x138 (without package)

Electrical Certification

DF75 follows the immunity test specification to equipment to industrial installation, as IEC61326:2002 standard.

Enclose:

Electrostatic discharge (IEC61000-4-2)	4 kV/8 kV contact/air
EM field (IEC61000-4-3)	10 V/m
Rated power frequency magnet field (IEC61000-4-8)	30 A/m

AC power:

Voltage dip/short interruptions (IEC61000-4-11)	0.5 cycle, each polarity/100%
Burst (IEC61000-4-4)	2 kV
Surge (IEC61000-4-5)	1 kV/2 kV
Conducted RF (IEC61000-4-6)	3 V

DC power

Burst (IEC61000-4-4)	2 kV
Surge (IEC61000-4-5)	1 kV/2 kV
Conducted RF (IEC61000-4-6)	3 V

I/O signal control

Burst (IEC61000-4-4)	1 kV
Surge (IEC61000-4-5)	1 kV
Conducted RF (IEC61000-4-6)	3 V

I/O signal control connected directly to power supply network:

Burst (IEC61000-4-4)	2 kV
Surge (IEC61000-4-5)	1 kV/2 kV
Conducted RF (IEC61000-4-6)	3 V

Emission Rate:

Enclose:

30 to 230 MHz (CISPR 16-1, CISPR 16-2)	40 dB (uV/m) quasi peak, measured at 10m distance
239 to 1000 MHz (CISPR 16-1, CISPR 16-2)	40 dB (uV/m) quasi peak, measured at 10m distance

AC mains:

0.15 to 0.5 MHz (CISPR 16-1, CISPR 16-2)	79 dB (uV) quasi peak 66 dB (uV) average
0.5 to 5 MHz (CISPR 16-1, CISPR 16-2)	73 dB (uV) quasi peak 60 dB (uV) average
5 to 30 MHz (CISPR 16-1, CISPR 16-2)	73 dB (uV) quasi peak 60 dB (uV) average

Note: For most recent updates, please consult Smar website www.smar.com.

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