

Frese MODBUS System

Application

Frese MODBUS System enables MODBUS communication of the entire OPTIMA Compact valve series.

At the same time an active temperature transmitter or any other active sensor type is MODBUS enabled with the flexible Frese MODBUS Converter.

A very compact design enables installation of valve and actuator with minimal space requirements while the MODBUS converter can be located at a more convenient location nearby.

High IP protection class and easy installation is obtained with use of preconfigured cables with M8 and M12 quality connectors.

One MODBUS Converter for all OPTIMA Compact valves also means just one standardized MODBUS register for all valves and sensors.

Up to 38 MODBUS actuators and 38 transmitters can be placed on the same MODBUS master for DN10-DN32 valves without external power supply.



Benefits

Design

- One Modbus Converter covers 2 actuators and 2 temperature transmitters
- Operation of two independent valves and two independent and active temperature transmitters.
- Robust and easy system to commission and install.

Installation

- Easy installation of actuators and sensors because of cables with pre-installed connectors
- Minimized commissioning time due to automatic balancing of the system
- No requirements for straight diameters of pipe upstream and downstream of the valve
- Can be easily installed where space is limited

Features

- MODBUS RTU RS485 24V AC/DC based system
- Protection class: IP54 in any installation direction
- Flexible installation room – very compact valve and actuator
- Daisy chain cabling between devices means fewer cables in installation
- Remote commissioning possible.
- Remote monitoring and possible error codes warnings (e.g. sticking valve)
- Preconfigured cables – low risk of installation issues
- Actuator display with visual indication of valve position (DN10 - DN32)
- Active or passive temperature transmitter input
- Valve position feedback via MODBUS
- Local LED light with status indication

Frese MODBUS System

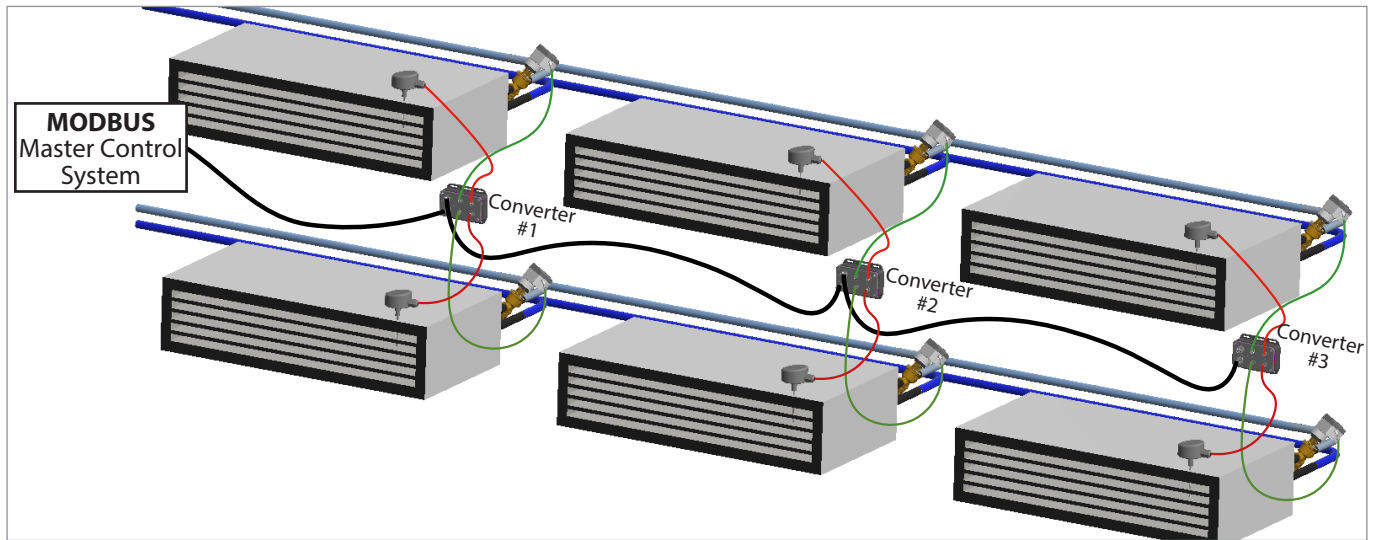
Function

Frese MODBUS RTU RS485 based system can be used to control 2 (0-10V) actuators and 2 temperature sensors. Both actuators and sensors are delivered with cables and connectors to plug directly into the MODBUS converter.

The MODBUS converter can operate 2 terminal units with an actuator and a temperature sensor for each unit, and is

connected in a daisy chain connection from the main control system.

The Frese MODBUS converter can be used in connection with OPTIMA Compact valves in all sizes, combined with the relevant standard 0-10V actuators, and is therefore a standardized and a very flexible solution for MODBUS control.



Power supply setup

The power consumption increases with the size of the valve and actuator. Therefore the number of Frese MODBUS converters in a daisy chain are depending on the valve dimension.

DC power is recommended as AC power reduces the total numbers of consumers in the daisy chain. The number of MODBUS Converters in series is limited to max. 4 A via the M12 connectors and cables due to the limitation of the supply for the actuators.

Valve dimension	* Number of converters without external power supply to actuators	
	(DC system)	(AC system)
DN10-DN32 (threaded valves)	19	12
DN40-DN50 (threaded valves)	8	6
DN50-DN125 (flanged valves)	4	3
DN150-DN200 (flanged valves)	1	1

*) Each MODBUS converter operates 2 actuators.

More MODBUS converters can be connected in series if external power supply is used (See page 7)

MODBUS Setup

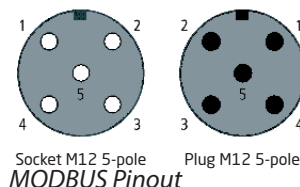
Frese MODBUS Converter supports the following function codes: 0 x 03 Read, 0 x 10 Write

All MODBUS registers are 16-Bit values.

Master MODBUS Controller: Connection description



MODBUS M12 – M12 Cable
Standard cable: **Not part of Frese delivery**



Pin	MODBUS In/Out
1	24V, L2, GND
2	24V, L1, +
3	Shield
4	Modbus D-
5	Modbus D+

Connections

Frese MODBUS System

Registers

Register address	Function code (03H/10H)	Explanation	Default	Unit	Scaling	Range / Enumeration
FFH MODBUS address 00H	W	Global function: Stand-by, Drives off, Sensors off	0000H	--	--	0 = Normal 8000H = Standby
01H	RW	Drive 1: New position	0000H	%	0,1	0..1000
02H	RW	Drive 2: New position	0000H	%	0,1	0..1000
03H	R	Drive 1: Read out current position	0000H	10 mV	0,01	0..1000
04H	R	Drive 2: Read out current position	0000H	10 mV	0,01	0..1000
05H	R	Sensor 1.1: Read out active sensor	0000H	mA	0,01	0-2000
06H	R	Sensor 2.1: Read out active sensor	0000H	mA	0,01	0-2000
09H	RW	Drive 1: on/off	000H	--	--	0000H = Off FFFFH = On
0AH	RW	Drive 2: on/off	000H	--	--	0000H = Off FFFFH = On
13H	RW	Reset: Drives will do new initialization STD: Power-off for 2 seconds	00H	--	--	0000H = Normal 8000H = Rst Drive1 0080H = Rst Drive2
14H	RW	Read out Error bits Drives		--	--	Bit 10: D2 Feedback > 9V Bit 11: D2 Feedback < 1V Bit 12: D1 Feedback > 9V Bit 13: D1 Feedback < 1V Bit 14: Fail detected Bit 15: Converter error
15H	RW	Transmitter setup	00FFH	--	--	8080H = Sensor on 8 sec. conversion time
16H	RW	Transmitter start measurement	00H	--	--	8000H = W start 0000H = R complete
17H	RW	Readout Error bits Sensors				Bit 0: reserved Bit 1: reserved Bit 2: S2 shorted Bit3: S2 Not found Bit 4: reserved Bit 5: reserved Bit 6: reserved Bit7: S1 reserved Bit 8: reserved Bit 9; reserved Bit 10: S1 shorted Bit 11: S1 not found Bit 12: PSU overloaded Bit 13: D2 blocked Bit 14: D1 Blocked Bit 15: Unknown error + time not set

Reading of temperature transmitter + trigger mode:

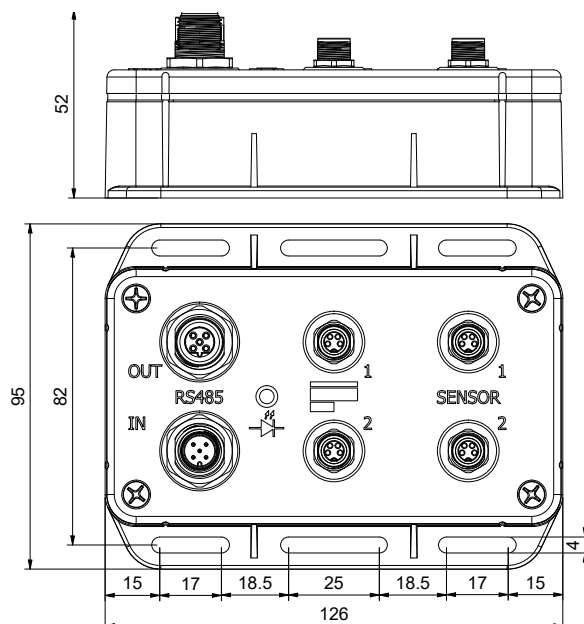
- Setup reading time:** Register 15H
- Start reading:** Register 16H (Poll for Zero)
- Read value:** 05H or 06H

Frese MODBUS System

MODBUS Converter (58-8955)

Technical Data

Function:	MODBUS Slave/Node
Control unit material:	Polyamide Halogenfree
Operation voltage:	24V AC/DC -10% / +20%
	Via bus cable
Power consumption:	Max 60mA (for the box only)
Control connection:	MODBUS RTU RS485
Protection Class:	IP54
	(Installed in all directions)
	IEC 61140 Class III
CE Conformity:	EN60730 Immunity Class B
Weight:	100g
Actuator control signal:	0-10V DC
	Bidirectional modulating
Temperature sensors:	4-20mA active transmitters
	or passive sensors
Ambient temperature:	0-50°C (During operation)
Baudrate: (Factory setting)	Automatic baudrate
	detection

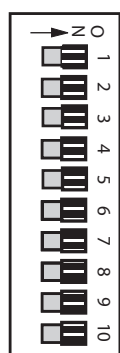


Commissioning

Standard-address setting is 244.

How to auto detect the baudrate:

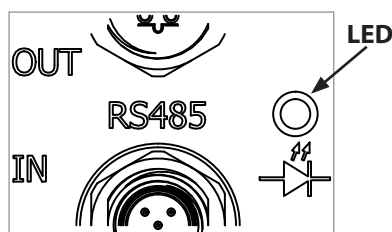
1. Open the MODBUS converter and change the address setting via DIP switch.
2. Switch on power supply for the MODBUS converter
3. Transmit a command to MODBUS converter address 01 using the preferred baudrate (always after power on)
E.g. 01 03 00 01 00 01 D5 CA
Now all MODBUS converters will use the new baudrate
Note: The above procedure needs to be repeated if the power supply has been down.
4. Send the setting of the MODBUS converter and the connected actuator and sensors. (See the register table, page 3)



Switch no.	Description	Pos. On	Pos. Off
1	MODBUS Address Bit 0	1	0
2	MODBUS Address Bit 1	1	0
3	MODBUS Address Bit 2	1	0
4	MODBUS Address Bit 3	1	0
5	MODBUS Address Bit 4	1	0
6	MODBUS Address Bit 5	1	0
7	MODBUS Address Bit 6	1	0
8	MODBUS Address Bit 7	1	0
9	Baud rate	Auto	19200
10	Termination	YES	NO

Default setting: All switched ON

LED indicator



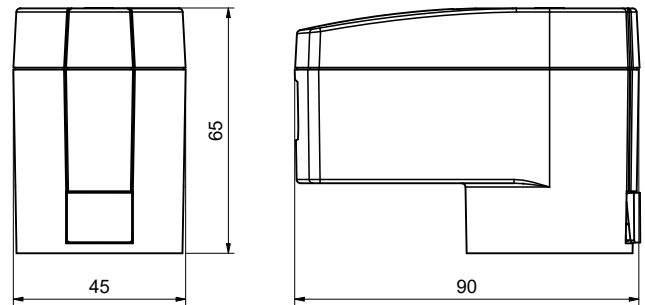
LED light	Description
Green	Normal function
White	Normal function, Modbus terminated
Green flashing	Public MODBUS traffic
White flashing	Sending MODBUS telegrams
Yellow	MODBUS converter in standby mode
Red flashing	One or both outputs are defect, because of overload or short circuit at the outputs of the valve drives

Frese MODBUS System

Actuator DN10-DN32

Technical Data

Characteristics:	Motoric actuator
Protection class:	IP 54 to EN 60529 (Can be installed in all directions)
Supply:	24V AC/DC
Frequency:	50/60 Hz
Control signal:	0-10V DC
Actuating force:	125 N
Stroke:	Auto calibration
Running time:	15 s/mm
Ambient operating conditions:	0°C to 50°C
Cable:	Halogen free incl. M8 connectors



Types and Operation Data DN10-DN32 actuators

Type	Valve Dimension	Cable length	Supply voltage	Power Consumption
58-8910	DN10-DN32	1 m	24V AC, -10 %... +20 %, 50-60 Hz 24V DC, -20 %... +20 %	*2,6 VA/ 1,4W
58-8911	DN10-DN32	3 m	24V AC, -10 %... +20 %, 50-60 Hz 24V DC, -20 %... +20 %	*2,6 VA/ 1,4W

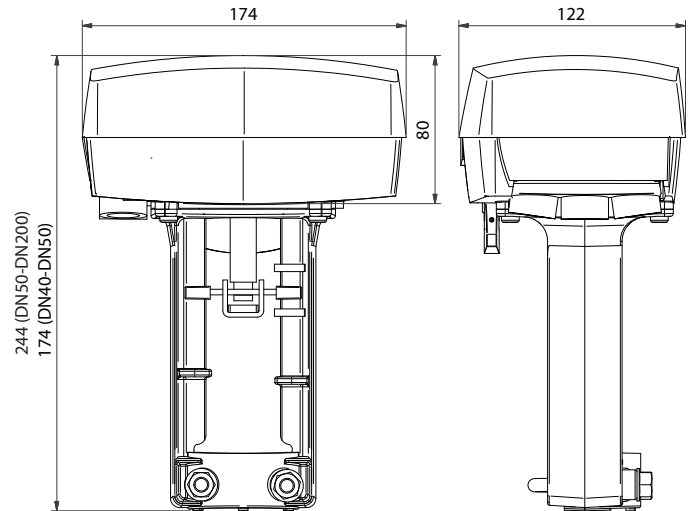
*) Max consumption - for transformer sizing

Frese MODBUS System

Actuator DN40-DN200

Technical Data

Characteristics:	Motoric actuator
Protection class:	IP 54 to EN 60529
Supply:	24V AC/DC
Frequency AC:	50/60 Hz
Control signal impedance:	Min. 100 kOhm (0-10V)
Stroke max:	32mm DN40-DN50 52mm DN50-DN200
Running time: DN40-DN50	60 s (0-10V) 60 s or 300 s
Running time: DN50-DN200	30 s (0-10V) 60 s or 300 s
Ambient operating conditions:	-10°C to 50°C
Manual operation:	Manual handle
Cable:	Not included



Types and operation data DN40-DN200 actuators

Type	Valve Dimension	Control signal Force	Supply voltage	Power Consumption
53-1296	DN40-DN50 threaded	0(2) - 10V / 3-pos 400N	24V AC +/-25% 24V DC +/- 10%	6 VA (*30VA)
53-1297	DN50-DN125	0(2) - 10V / 3-pos 800N	24V AC +/-25% 24V DC +/- 10%	15 VA (*50VA)
53-1298	DN150-DN200	0(2) - 10V / 3-pos 1500N	24V AC +/-25% 24V DC +/- 10%	24 VA (*50VA)

*) Max consumption - for transformer sizing

Frese MODBUS System

MODBUS system cables

	Type	Item no.	Used for	Cable length
	Cable with M8 connector in one end and 4 free wires in the other end	58-8952	OPTIMA Compact Actuators DN40-200	5 m Halogen free
	Extension cable with M8 connection in both ends	58-8953	Extension cable for all OPTIMA Compact actuators and sensors	5 m Halogen free

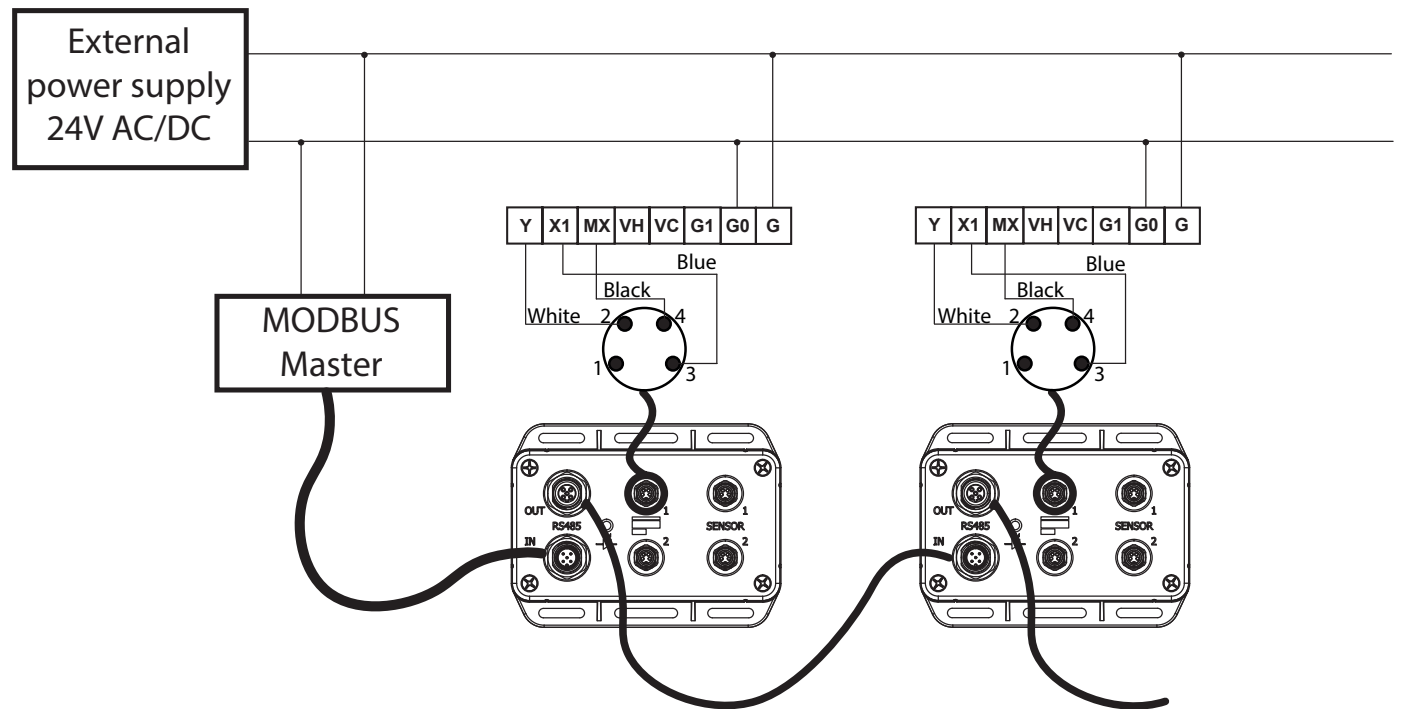
Cable connection for DN40-DN200 actuators

Y	X1	MX	VH	VC	G1	G0	G
White	Blue				Black	Brown	

Color	Function
Brown	VCC+, G (pin 1)
White	Feedback, Y (pin2)
Blue	0-10V input signal, X1 (pin3)
Black	VCC-, G0 GND (pin4)

MODBUS cable
External power supply
Wiring color
Modbus M8 cable Pinout (Male)

MODBUS & External power supply connection for DN40-DN200 actuators

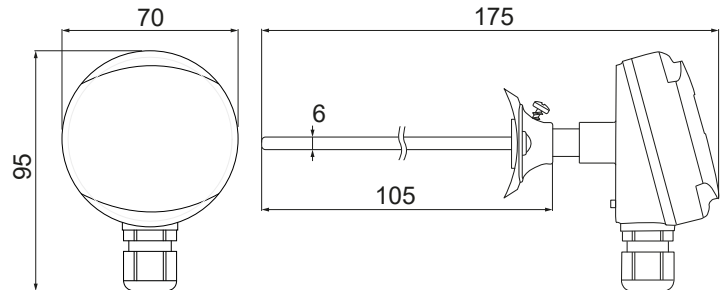


Frese MODBUS System

Temperature Transmitter (58-8954)

Technical Data

Characteristics:	PT1000 EN60751/B
Protection class:	IP 54 to EN 60529
Supply:	15..35V DC
Material:	AISI316 (Sensor) Plastic (Housing)
Pressure class:	PN16
Ambient operating conditions:	0°C to 60°C
Measuring range:	0°C to 100°C Adjustable by DIP switches
Cable:	3.0 m halogen free incl. connector



Selecting measuring range

0...+50 °C	*0...+100 °C	-50...+50 °C	-50...+150 °C
S1 S2	S1 S2	S1 S2	S1 S2
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

*) Factory setting

Output signal

0...+50	0...+100	-50...+50	-50...+150	Signal
0 °C	0 °C	-50 °C	-50 °C	4 mA
25 °C	50 °C	0 °C	50 °C	12 mA
50 °C	100 °C	50 °C	150 °C	20 mA

Installation:

Delivered with flange for installation in airducts.
Can also be installed in sensor pockets by removing air duct flange

OPTIMA Compact PICV

Technical data

Valve housing:	DZR Brass, CW602N
DN10-DN32	Cast/Ductile Iron
DN40-DN200	
Spring:	Stainless steel
Diaphragm:	HNBR/EPDM
O-rings:	EPDM
Pressure class:	PN25 (DN10-DN50) PN16/25 (DN50-DN200)
Max. differential pressure:	800 kPa
Medium temperature range:	0°C to 120°C
Flow range:	See OPTIMA Compact Technote



Frese MODBUS System

Product Programme

	Type	Frese no.
	Frese MODBUS System 1 x MODBUS Converter 2 x Actuators (DN10-DN32) 2 x Temperature sensors	58-8999

Accessory

	Type	Frese no.
	MODBUS Converter	58-8955
	Temperature sensor with cable and M8 connector	58-8954
	Actuator with cable and M8 connector For OPTIMA Compact DN10-DN32	58-8910 - with 1 m cable
		58-8911 - with 3 m cable
	Actuator for OPTIMA Compact DN40-DN50	53-1296
	Actuator for OPTIMA Compact DN50-DN125	53-1297
	Actuator for OPTIMA Compact DN150-DN200	53-1298
	Halogen free cable with M8 connector and free wire, 5m	58-8952 For connection of Frese actuators DN40-DN200
	Halogen free cable with M8 connectors, 5m	58-8953 Extension cables for actuators and temperature sensors
	OPTIMA Compact Pressure Independent Control Valve	OPTIMA Compact See Technote

Specification Text

- The MODBUS System must be able to handle 2 terminal units with an analoge temperature sensor and a modulating actuator.
- The valve shall be supplied with 1" PT plugs.
- The pressure independent control valve shall be capable of closing against a maximum differential pressure of 600 kPa (6 bar) DN15-25 and 800 kPa (8 bar) DN25L- DN200 with a leakage rate at maximum 0.01% of the maximum rated volumetric flow and comply to EN1349 Class IV.
- The pressure independent control valve must be tested in accordance with the BSRIA document BTS.1 "Test Method for Pressure Independent Controls Valves" and manufacturer must be able to provide the test results upon request.

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