JX3-DMS2

Strain Gage Module

User Manual

Jetter

Item # 60876266

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Assignment to Product

This application note is an integral part of JX3-DMS2:

Type: _____

Serial #: _____

Year of construction: _____

Order #: _____

CE

To be entered by the customer:

Inventory #: _____

Place of operation: _____

Significance

Significance of this application note

The application note is an integral part of JX3-DMS2:

- It must be kept in a way that it is always at hand, until the JX3-DMS2 will be disposed of.
- If the JX3-DMS2 is sold or loaned/leased out, the application note has to be passed on.

In any case you encounter difficulties to clearly understand this application note, please contact the manufacturer.

We would appreciate any suggestions and contributions on your part and would ask you to contact us by our e-mail address info@jetter.de. This will help us to produce manuals that are more user-friendly and to address your wishes and requirements.

This application note contains important information on how to transport, erect, install, operate, maintain and repair the JX3-DMS2.

Therefore, the persons carrying out these jobs must carefully read, understand and observe this application note, and especially the safety instructions.

Missing or inadequate knowledge of the application note results in the loss of any claim of liability on part of Jetter AG. Therefore, the operating company is recommended to have the instruction of the persons concerned confirmed in writing.

Table of Contents

1 Safety Instructions

Introduction

This chapter informs the user of general safety instructions and warns of residual dangers, if applicable. Furthermore, it contains information on EMC.

Contents

Generally Valid Safety Instructions

Introduction

This device complies with the valid safety regulations and standards. Special emphasis was given to the safety of the users.

Of course, the user should adhere to the following regulations:

- relevant accident prevention regulations;
- accepted safety rules;
- EC guidelines and other country-specific regulations

Intended Conditions of Use

Intended conditions of use include operation in accordance with this application note.

The JX3-DMS2 module is a JX3 peripheral module of two analog inputs for connection to analog strain gage sensors. It can be connected to the JX3 system bus. The JX3 system bus starts at the JX3-BN-xxx bus head or at the controller JC-3xx. By means of the bus head JX3-BN-CAN, the JX3-DMS2 can be connected to the controllers JC-24x und JC-647, as well as to the dual axis controller JM-D203-JC24x. The JX3-BN-xxx or JX3-PS1 module supplies the JX3-DMS2 module with voltage. This operating voltage is classified as SELV (Safety Extra Low Voltage). The JX3-DMS2 module is therefore not subject to the EU Low Voltage Directive.

The JX3-DMS2 module may only be operated within the limits of the stated data, see chapter Technical Data.

The device is used to control machinery, such as conveyors, production machines, and handling machines.

Usage Other than Intended

This device must not be used in technical systems which to a high degree have to be fail-safe, e. g. ropeways and aeroplanes.

If the device is to be run under ambient conditions which differ from the conditions mentioned in chapter **Operating Conditions** on page 136, the manufacturer is to be contacted beforehand.

Who may Operate the Device?

Only instructed, trained and authorized persons are permitted to operate this device.

Transport:	Only by personnel with knowledge in handling electrostatically sensitive components.
Installation:	Only by specialists with training in electrical engineering.
Engineering:	Only by trained personnel, as specific know-how of electrical engineering is required.
Commissioning:	Only by specialists with profound knowledge of, and experience with, electrical engineering / drive technology.

Modifications and Alterations to the Device

For safety reasons, no modifications and changes to the device and its functions are permitted.

Any modifications to the device not expressly authorized by the manufacturer will result in a loss of any liability claims to Jetter AG.

	The original parts are specifically designed for the device. Parts and equipment from other manufacturers are not tested on our part, and are, therefore, not released by Jetter AG. The installation of such parts may impair the safety and the proper functioning of the device. Any liability on the part of Jetter AG for any damages resulting from the use of non-original parts and equipment is excluded.
Repair and Maintenance	This device must not be repaired by the operators themselves. The device does not contain any parts that could be repaired by the operator. The device must be sent to Jetter AG for repair.
Decommissioning and Disposal	The environmental regulations of the respective country must be complied with when decommissioning and disposing of devices on the operating company's premises.
Transporting JX3 Modules	To exclude damages to JX3 modules the JX3 backplane bus has to be attached during transport. This is particularly true for transport via mail.
Replacing Modules	During exchange of JX3 modules, degree of protection IP20 is not ensured. Do not touch any electronic components once the JX3 module enclosure has been removed from the JX3 backplane module. Touching the EMC clip may result in damages to this clip and, thus, in lower noise immunity.

Ensure Your Own Safety

Ensure Your Own Safety

Follow this procedure in order to ensure your own safety:

Measures	Action
1	Isolate the device from the mains, if maintenance works have to be carried out. By doing so, you will prevent accidents resulting from electric voltage and moving parts.
2	Safety and protective devices, e.g. the barrier and cover of the terminal box, must never be shunted or by-passed.
3	Dismantled protective equipment, such as guards, must be reattached prior to commissioning and checked for proper functioning.
4	Prior to commissioning, the machine manufacturer shall conduct a hazard analysis for the machine and take appropriate measures to prevent personal injury and damage to property resulting from accidental movements.

Malfunctions or Other Damages

Follow this procedure in the case of malfunctions or damages:

Measures	Action
1	**Immediately separate the device from the mains.**
2	The device must be protected from improper or inadvertent use.
3	Malfunctions or other damages are to be reported to a responsible person at once.

Information Signs and Labels

Markings, information signs, and labels always have to be observed and kept readable.

Damaged or unreadable information signs and labels have to be replaced.

Instructions on EMI

Noise Immunity of a System

The noise immunity of a system is determined by the weakest component of the system. For this reason, correct wiring and shielding of cables is of paramount importance.

Measures

Measures for increasing EMI in electric plants:

- The JX3-DMS2 module has to be attached to a DIN rail acc. to EN 50022-35 x 7.5.
- Follow the instructions given in Application Note 016 "EMC-Compatible Installation of the Electric Cabinet" published by Jetter AG.

The following instructions are excerpts from Application Note 016:

- On principle, **physical separation** should be maintained between signal and power lines. We recommend spacings greater than 20 cm. Cables and lines should cross each other at an angle of 90°.
- The following line cables must be shielded:
  Analog lines, data lines, motor cables coming from inverter drives (servo output stage, frequency converter), lines between components and interference suppressor filter, if the suppressor filter has not been placed at the component directly.
- Shield cables **at both ends**.
- Unshielded wire ends of shielded cables should be as short as possible.
- The entire shield **must**, in its entire perimeter, be drawn behind the isolation, and then be clamped under an earthed strain relief **with the greatest possible surface area**.

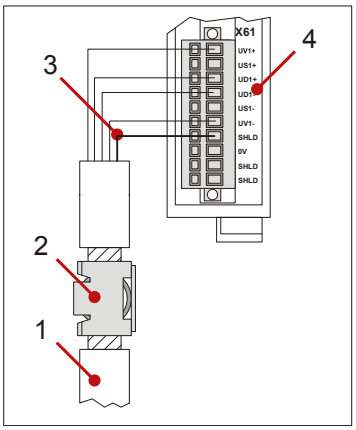
Downloading Application Note 016

You can download Application Note 016 from the Jetter AG homepage at **Homepage http://www.jetter.de**. The path leading to Application Note 016 "EMC-Compatible Installation of Electric Cabinets" is: "Industrial Automation - Support - Downloads - 07_application_notes".

Improving the Noise Immunity

For improving the noise immunity, please give heed to the following rules:

- Connect the copper drain wire (3) directly to the terminal point X61.SHLD, respectively X62.SHLD.
- Use a shielding terminal (2) for additionally earthing the shield of the wire.



Number	Device
1	Cable leading to the analog sensor
2	Shielding terminal
3	Tinned copper drain wire
4	Connectors of the JX3-DMS2 module

- Loop the sensor wires (entire cable) connected to inputs X61, respectively X62, of the JX3-DMS2 module through a ferrite core each at least once or twice.

  This way, correct measurements are achieved and external interferences can be minimized. You can use a round cable snap ferrite (e.g. 74271222 by Würth Elektronik).

  Tests with an RF injection (10 V/m) resulted in a higher susceptibility to interference.

2 Engineering - JX3-DMS2

Purpose of this Chapter

This chapter is for supporting you when engineering a plant equipped with the JX3-DMS2 module in the following fields of activity:

- Planning the wiring between the JX3-DMS2 module and the analog sensors
- Selecting the analog sensors
- Connecting the analog sensors to the module JX3-DMS2
- Commissioning the JX3-DMS2 module in the control cabinet

Contents

Product Description JX3-DMS2

The JX3-DMS2 Module

The JX3-DMS2 module is a peripheral device for connecting strain gages. The module has got two inputs for connecting strain gages.

Product Features

The product features are shown in the list below:

- 2 inputs for strain gages
- Sensitivity of 1 mV/V .. (theoretically) 400 mV/V
- Resolution: 16 bit, internal oversampling 8 ... 1,024-fold
- 2 voltage supply outputs:
  DC 5 V / per 100 mA, short-circuit-proof
- Gain that can be parameterized: V = 0.5 ... 1,150
- Typical conversion time of a channel: 6 ms

Additional Features

The JX3-DMS2 module has got the following additional features:

- User-scaling
- Monitoring and evaluation of limits
- Trailing indicator
- Oscilloscope function
- Operating system update by means of JetSym

Scope of Delivery

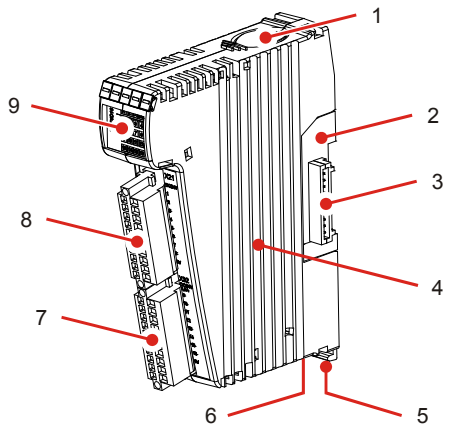
The following items are included in the scope of delivery of the JX3-DMS2 module:

Article #	Quantity	Description
10000612	1	JX3-DMS2
60869252	2	10-pin plug-in connector, spring cage technology
60870411	10	Terminal labels
60872977	1	Installation instructions
60870410	1	Keying pins

Parts and Interfaces of the Module

Parts and Interfaces

The JX3-DMS2 module is supplied with the following parts and interfaces:



Number	Part	Function
1	Upper locking mechanism	For removing the JX3 module enclosure from the JX3 backplane module
2	JX3 backplane module	Connection of the JX3 modules, blue
3	X119	Connectors for further JX3 modules
4	JX3 module enclosure	Can be removed from the JX3 backplane module; color: light gray
5	Unlocking mechanism	For removing the JX3 module from the DIN rail
6	Lower locking mechanism	For removing the JX3 module enclosure from the JX3 backplane module Not visible in the illustration
7	Terminal X62	Connection of analog sensor 2
8	Terminal X61	Connection of analog sensor 1
9	LEDs	Diagnostics and status display

Minimum Requirements

Introduction

The JX3-DMS2 module is operated in a system consisting of several components made by Jetter AG. In order to guarantee perfect interaction of these components, the applied operating systems and the programming software JetSym have to be of a certain version.

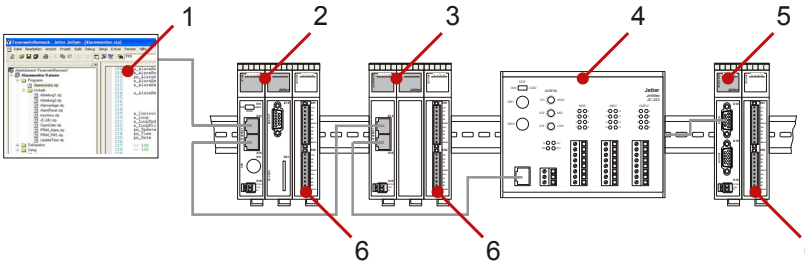
Configurations

The JX3-DMS2 module can be applied within the following configurations:

- at a JetControl 3xx
- at a JX3-BN-ETH (Ethernet bus head)
- at a system bus of a JetControl 24x via CAN bus head JX3-BN-CAN
- at a system bus of a dual-axis controller JM-D203-JC 24x via CAN bus head JX3-BN-CAN
- at a system bus of a JC-647 with a submodule JX6-SB(-I) via CAN bus head JX3-BN-CAN

Minimum Requirements

The following minimum requirements on modules, controllers and software apply to the functions described in this document:



Number	Part	Function	As of Release No.
1	JetSym	Programming software	V 3.00
2	JC-3xx	Control system JetControl 3xx	V 1.00
3	JX3-BN-ETH	Ethernet bus head	V 1.00
4	JC-24x	Control system JetControl 240	V 3.23
	JC-647	Control system JetControl 647	V 3.50
	JX6-SB(-I)	Submodule for system bus	V 2.17
5	JX3-BN-CAN	CAN bus head	V 1.03.0.00
6	JX3-DMS2	Analog input module	V 1.01.0.00

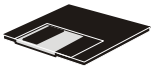
JX3-Modules: List of Documentation

Introduction

Various documents and software tools will support the user when engineering and installing and programming the JX3-DMS2 module. These documents and software tools can be downloaded from our **homepage http://www.jetter.de**.

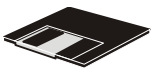
Engineering

When performing engineering tasks, the following documents and files will support you:

	**Data Sheet on the JX3-DMS2 Module**
	■ Product description
	■ Technical data
	■ Dimensional drawings
	**User Manual on the JX3-DMS2 Module**
	■ The document at hand
	**CAD Data of the JX3-DMS2 Module**
	■ 2D illustrations (dxf file)
	■ 3D illustrations (stp file)
	**User Manual on the JC-3xx Control System**
	■ Engineering a JX3 station
	■ Product descriptions of JX3 modules

Engineering at the JX2 System Bus

When engineering a JX3 station on the system bus (JC-24x and JC-647), the following document and software tool will support you:

	**JX2-I/O System - User Information**
	■ System bus topology
	■ Specification of the JX2 System Bus
	■ Product descriptions of JX3-BN-CAN, JX2 modules, IP67 modules and third-party modules
	**System Bus Configurator**
	■ Excel file for designing the system bus
	■ SysBus_Configuration_xxx_e.xls (xxx: Version)

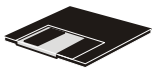
Installation

When installing such modules, the following document will support you:

	**Installation Instruction**
	It is included in the boxed module JX3-DMS2 and contains the following information:
	■ Installation of the module on a DIN rail
	■ Terminal assignment
	■ Specification of conductor terminals
	■ Diagnostics via LEDs
	**User Manual on the JX3-DMS2 Module**
	■ The document at hand

Programming

When programming the module, the following documents and software tools will support you:

	**User Manual on the JX3-DMS2 Module**
	■ The document at hand
	**JX2-I/O System - User Information**
	■ Module numbering system
	■ Diagnostics of the modules on the JX2 system bus
	**JetSym**
	■ Programming tool
	**User Manual of the Controller**
	■ Depending on the controller used, you will need the corresponding manual

Accessories for the JX3 System

Labelling Field

Ten labelling fields are included in the scope of delivery of the JX3-DMS2 module:

Designation	DIV_DEK_5/5_MC-10_NEUT._WS
Article #	60870411
VPE	100 pcs.

Keying Pins

One keying pin is included in the scope of delivery of the JX3-DMS2 module:

Designation	DIV_BL_SL_3.5_KO_OR
Article #	60870410

Strain Relief for BU_10_E_BLZF_GE_RM 3.5

Designation	DIV_BL_3.5_ZE_8
Article #	60870963

End Clamp for DIN Rail

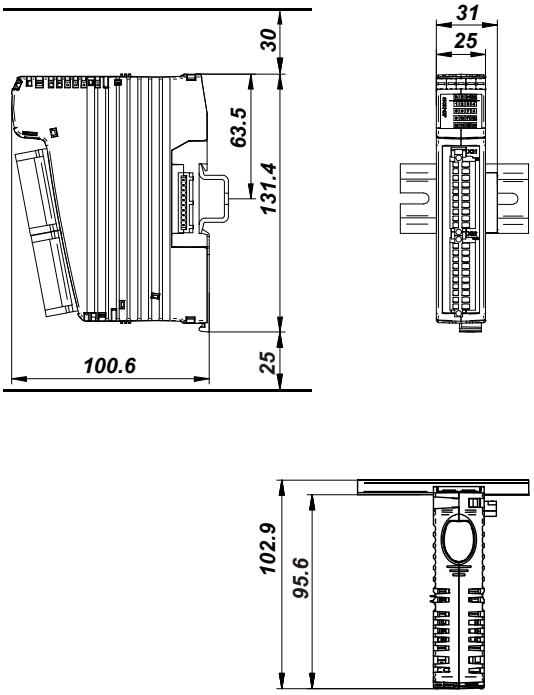
Designation	DIV_CLIPFIX_35
Article #	60863970

Screw Driver

Type	SD 0.4 x 2.5 - DIN 5264-A
Designation	DIV_SCHRAUBENDREHER_2.5*75
Article #	60871712

Physical Dimensions

Physical Dimensions



Minimum Clearances

At mounting the JX3-DMS2 module, make sure to maintain a minimum clearance above and below. At replacing the module, you can operate the locking mechanisms of the JX3 backplane module using your fingers.

- Minimum clearance above: 30 mm
- Minimum clearance below: 25 mm

Module Width

The JX3-DMS2 module requires a space of 31 mm width. At connecting the JX3-DMS2 module to a JX3 station, the width is increased by 25 mm.

Mounting Position

The mounting position of the JX3-DMS2 module is vertical.

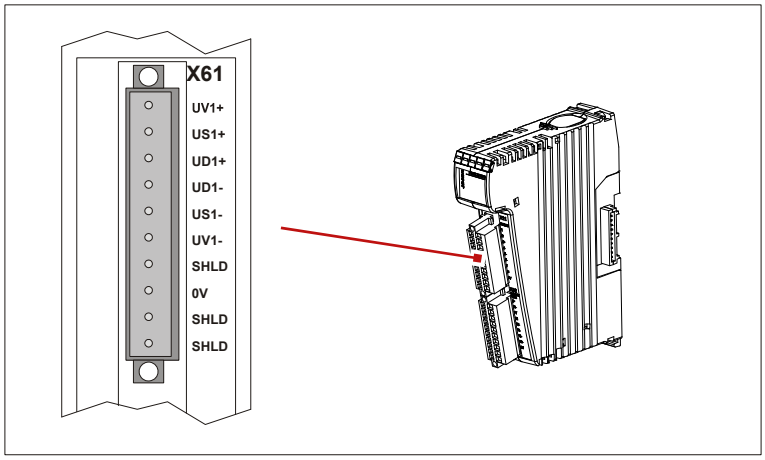
Terminal Assignment X61

Interfaces of Terminal X61

The signals of the following interfaces are connected to terminal X61:

- Power supply of the analog resistive sensor (generally Excitation+ / Excitation-)
- Analog inputs of the signal (generally Signal+ / Signal-)

Terminal Assignment X61



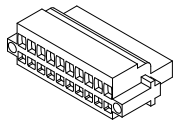
Terminal Point	Function
UV1+	Power supply+ for the sensor (5 V / 100 mA)
US1+	do not connect
UD1+	Signal+ of the sensor
UD1-	Signal- of the sensor
US1-	do not connect
UV1-	Power supply- for the sensor
SHLD	Shielding
0 V	Reference potential
SHLD	Shielding
SHLD	Shielding

Technical Data

Parameters	Value
Output type	Short-circuit proof
Rated voltage	DC 5 V
Load current	0.1 A max. at UV1+

Connector BLZF for Terminal X61

Two ten-pin connectors are included in the scope of delivery of the JX3-DMS2 module. For connecting strain gages, only BLZF connectors are allowed to be used.



Designation	BU_10_E_BLZF_GE_RM3.5
Item #	60869252

Related Topics

- **Technical Data** on page 134
- **Connecting Analog Actuators** on page 29
- **Specification of the BLZF Connector** on page 27

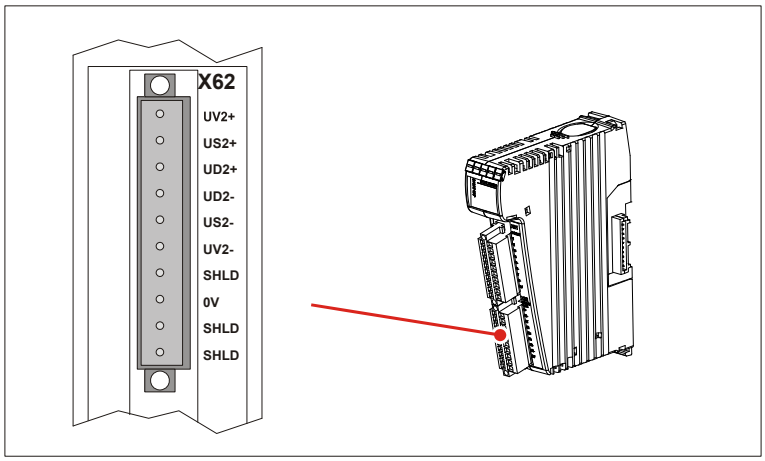
Terminal Assignment X62

Interfaces of Terminal X62

The signals of the following interfaces are connected to terminal X62:

- Power supply of the analog resistive sensor (generally Excitation+ / Excitation-)
- Analog inputs of the signal (generally Signal+ / Signal-)

Terminal Assignment X62



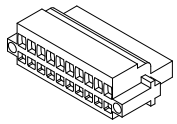
Terminal Point	Function
UV2+	Power supply+ for the sensor (5 V / 100 mA)
US2+	do not connect
UD2+	Signal+ of the sensor
UD2-	Signal- of the sensor
US2-	do not connect
UV2-	Power supply- for the sensor
SHLD	Shielding
0 V	Reference potential
SHLD	Shielding
SHLD	Shielding

Technical Data

Parameters	Value
Output type	Short-circuit proof
Rated voltage	DC 5 V
Load current	0.1 A max. at UV2+

Connector BLZF for Terminal X62

Two ten-pin connectors are included in the scope of delivery of the JX3-DMS2 module. For connecting strain gages, only BLZF connectors are allowed to be used.



Designation	BU_10_E_BLZF_GE_RM3.5
Item #	60869252

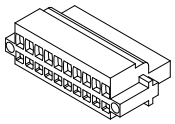
Related Topics

- **Technical Data** on page 134
- **Connecting Analog Actuators** on page 29
- **Specification of the BLZF Connector** on page 27

Specification of the BLZF Connector for Terminals X61 / X62

Ordering Data of the Connector

Two ten-pin connectors are included in the scope of delivery of the JX3-DMS2 module.



Designation	BU_10_E_BLZF_GE_RM3.5
Item #	60869252

Connector Specification

The connector is specified by the following list:

Connector Specification	
Connector technology	Spring cage connection
Type	10-pin, contact spacing 3.5 mm
Connectible Conductors	
Outer diameter of the isolation	2.90 mm max.
AWG	16 ... 28
Terminal range	0.13 ... 1.5 mm^2
Stripping length	10 mm
Specification Without Wire End Ferrules	
One-wire H05(07) V-U	0.2 ... 1.5 mm^2
Flexible H05(07) V-K	0.2 ... 1.5 mm^2
Specification With Wire End Ferrules	
Bootlace ferrule without sleeve DIN 46228/1	0.2 ... 1.5 mm^2
Bootlace ferrule with sleeve DIN 46228/4	0.2 ... 1.5 mm^2
Crimping tool DIN 46228	PZ 4, PZ 6 ROTO, PZ 6/5

Screw Driver

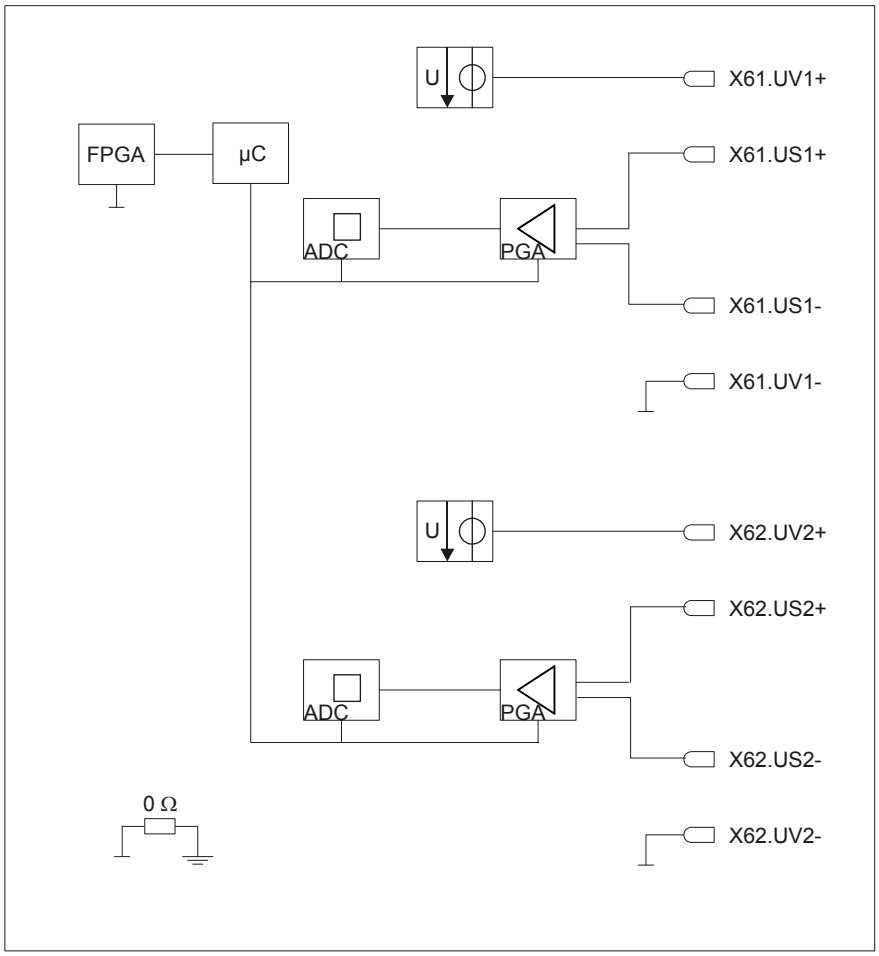
The fitting screw driver can be ordered from Jetter AG directly.

Type	SD 0.4 x 2.5 - DIN 5264-A
Designation	DIV_SCHRAUBENDREHER_2.5*75
Item #	60871712

Block Diagram

Internal Block Diagram

The JX3-DMS2 module is equipped with 4 analog inputs.



Component	Function
FPGA	Communication component
µC	Analog-digital converter control, calculation
PGA	Programmable gain amplifier from 0 to 60 dB
ADC	Analog-digital converter
X61.UV1+ X61.UV2+	Power supply for the sensors 5 V / 100 mA, short-circuit proof
X62.UV1+ X62.UV2+	Power supply for the sensors 5 V / 100 mA, short-circuit proof

Connecting Analog Sensors

Conductor Design

The constituents of the cable for connecting analog sensors have to be the following:

- The shielding is imperative; it is best to connect the signal via twisted pair cables and to connect the shield at one or two positions to SHLD.
- Tinned copper drain wire
- Cable length: <= 3 m
- Cable cross-section: 0.14 mm

Characteristics of the Sensor

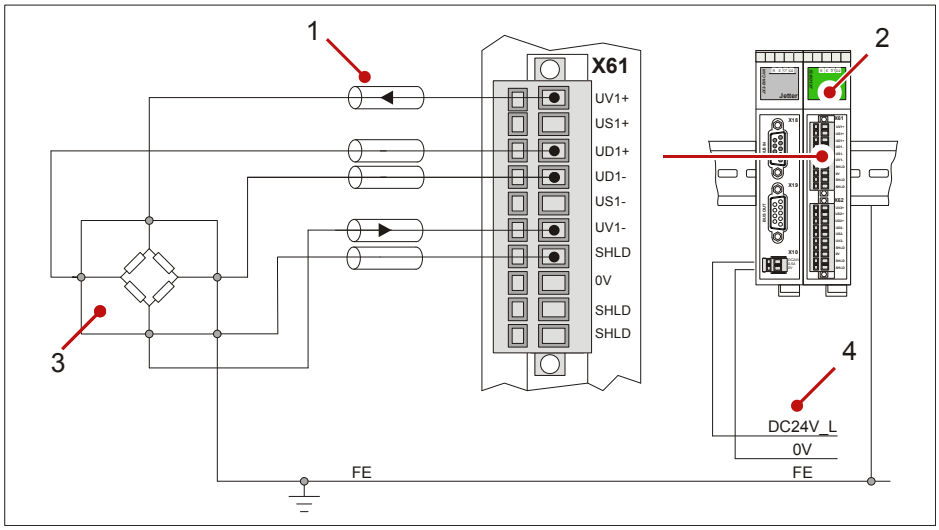
To the JX3-DMS2 module, resistive sensors can be connected in a bridge circuit.

Make sure that the permitted total current of 100 mA is not exceeded, if several sensors are to be connected in parallel.

The sensor is connected in the so-called four-wire mode.

Connecting Analog Sensors

The connection of analog sensors is identical for both inputs. In the following illustration, a sensor has been connected to the input.

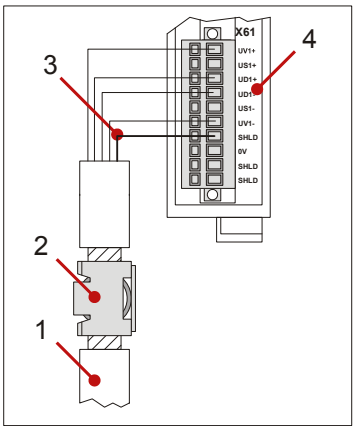


Number	Device
1	Cable leading to the analog sensor
2	Analog input module JX3-DMS2
3	Analog sensor with power supply and measuring lines
4	Power supply for the JX3 station

Improving the Noise Immunity

For improving the noise immunity, please give heed to the following rules:

- Connect the copper drain wire (3) directly to the terminal point X61.SHLD, respectively X62.SHLD.
- Use a shielding terminal (2) for additionally earthing the shield of the wire.



Number	Device
1	Cable leading to the analog sensor
2	Shielding terminal
3	Tinned copper drain wire
4	Connectors of the JX3-DMS2 module

- Loop the sensor wires (entire cable) connected to inputs X61, respectively X62, of the JX3-DMS2 module through a ferrite core each at least once or twice.
  This way, correct measurements are achieved and external interferences can be minimized. You can use a round cable snap ferrite (e.g. 74271222 by Würth Elektronik).
  Tests with an RF injection (10 V/m) resulted in a higher susceptibility to interference.

Related Topics

- **Technical Data** on page 134
- **Terminal Assignment X61** on page 23
- **Terminal Assignment X62** on page 25
- **Internal Block Diagram** on page 28

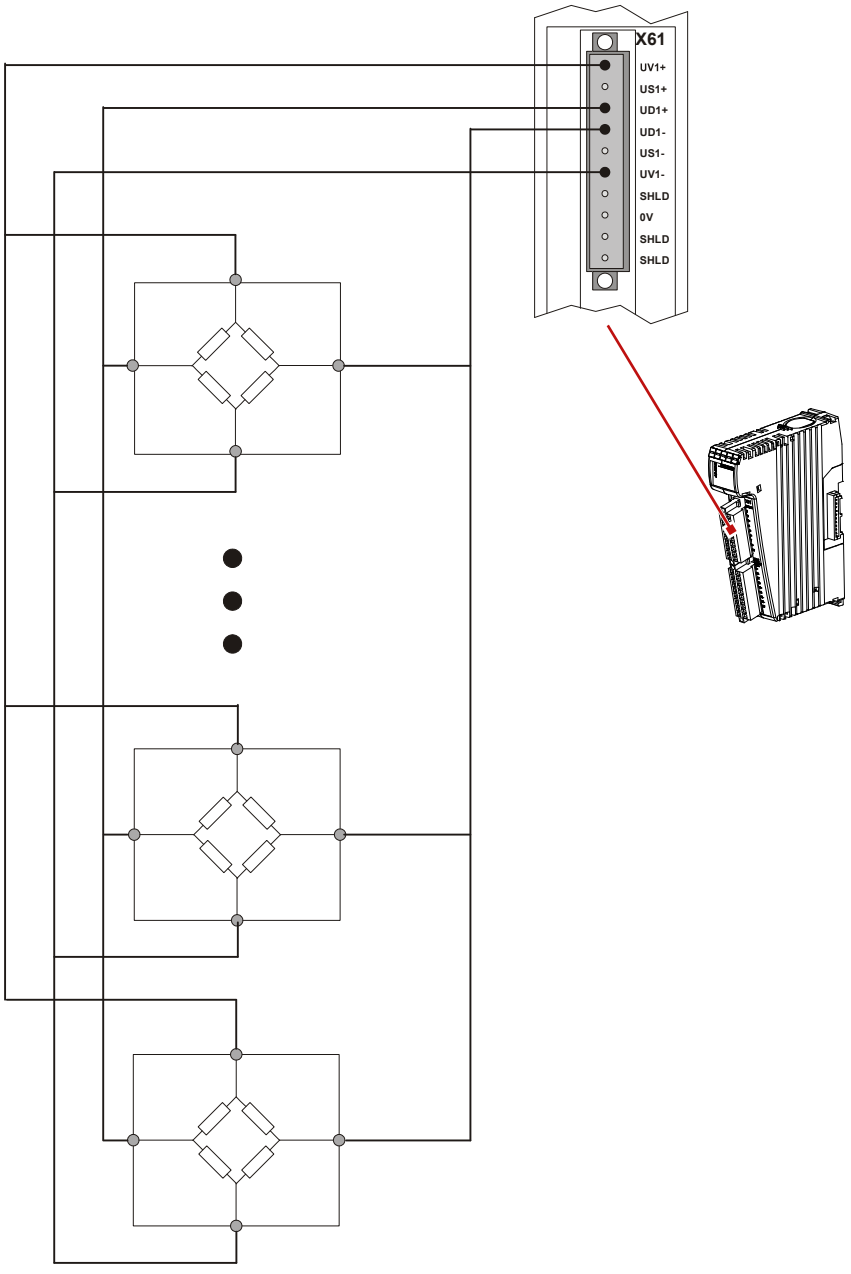
Parallel Connection of Several Sensors

Parallel Connection of Several Sensors

Connect several strain gages to one input in parallel.

Connection Diagram of Parallel Connection

The following illustration shows the connection diagram for several sensors to one channel (here channel 1).



Notes on Parallel Circuits

- Connect the sensors to the terminal in parallel mode, in order to prevent the forward-slope resistance from falling below 50 Ohm.
- The wires of the sensors you connect have to be equipped with output resistances being calibrated in dependence from one another. Never shorten the calibrated sensor wires!
- After connecting the sensors, carry out user-scaling.

Limiting the Output Currents

Limiting the Total Current

Each of the two analog outputs X61.UV1+ / X61.UV1- and X62.UV2+ / X62.UV2- of the JX3-DMS2 module can be loaded with 100 mA max.

Component	Permitted Current
Current of one individual analog output	100 mA max.

Consequences of Too High a Total Current

Exceeding the maximum individual current can lead to the following behavior:

- One or both output drivers signalize short circuit.
- The JX3-DMS2 module shortly switches individual analog outputs off and on again. They start pulsating.
- Communication with the bus head, or with the JC-3xx controller is not interrupted. Module register 2, respectively 3, display value 0,000.
- LED D2 is lit permanently.

Remedy

Separate the wire from the sensor and check for a short circuit. The permitted minimum resistance must not fall below 50 Ohm. Restart the module (reset).

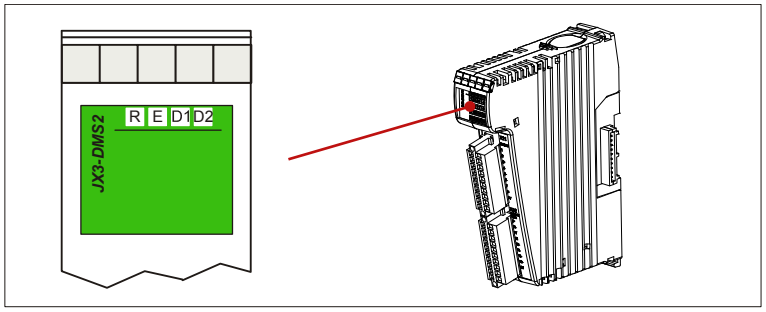
Note!

If a forward-slope resistance in the supply line X61.UV1+ / X61.UV1-, respectively X62.UV2+ / X62.UV2- smaller than 62.5 Ohm is applied, fault tolerance of the JX3-DMS2 module to DIN EN 61131-2/Part 2 is not guaranteed.

LEDs of the JX3-DMS2 Module

LEDs of the Module

The JX3-DMS2 module signalizes states and errors via LEDs. This feature facilitates spotting an error immediately.



LED	Color	Designation
R-LED	green	Run LED
E-LED	red	Error-LED
D1-LED	red	Diagnostics 1 LED
D2-LED	red	Diagnostics 2 LED

Normal Operating Condition

The LEDs of the JX3-DMS2 module have got the following states during normal operation:

R	E	D1	D2	Normal Operating Condition
ON	OFF	OFF	OFF	No error, communication is active

LEDs of the JX3-DMS2 Module

The JX3-DMS2 module is equipped with four LEDs to display states and errors.

R	E	D1	D2	State
ON	OFF	OFF	OFF	No error, communication is active
ON	-	-	ON	Short circuit / overload of channel 1 or channel 2

3 Installing, Replacing, and Removing the Module

Introduction

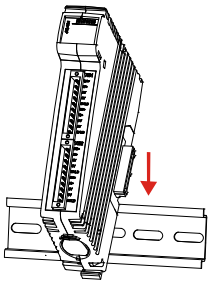
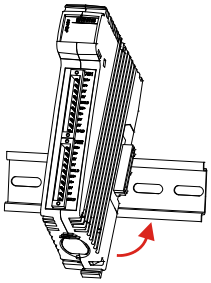
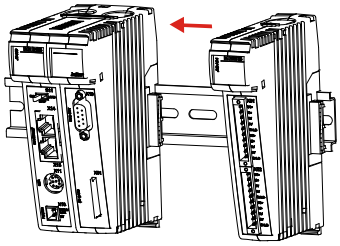
This chapter covers installation, replacement and removal of JX3 modules.

Contents

Installing a JX3 Peripheral Module on a DIN Rail

Installation

To install a JX3 peripheral module on a rail to DIN EN 50022 proceed as follows:

Step	Action	
1		Place the JX3 peripheral module on the upper edge of the DIN rail.
2		Snap the JX3 peripheral module onto the lower edge of the DIN rail.
3		Slide the JX3 peripheral module to the other modules of the JX3 station.

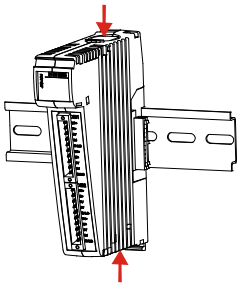
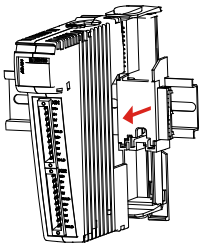
Related Topics:

- **Replacing a JX3 Peripheral Module** on page 37
- **Removing a JX3 Peripheral Module from the DIN rail** on page 39

Replacing a JX3 Peripheral Module

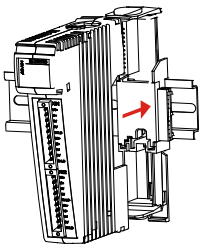
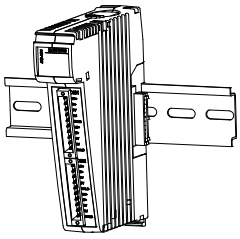
Removing the JX3 Enclosure

To remove the JX3 enclosure of the JX3 peripheral module from the JX3 backplane module proceed as follows:

Step	Action	
1	Remove power from the JX3 station.	
2		Press the upper and lower latches. Keep the latches pressed.
3		Pull off the JX3 enclosure from the JX3 backplane module.

Installing the JX3 Enclosure

To attach the enclosure of the JX3 peripheral module to the JX3 backplane module proceed as follows:

Step	Action	
1		Slide the JX3 enclosure onto the JX3 backplane module until the latches snap into place.
		**Result:** Installation of the JX3 peripheral module to the JX3 backplane module is now completed.

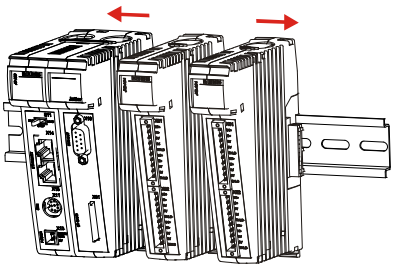
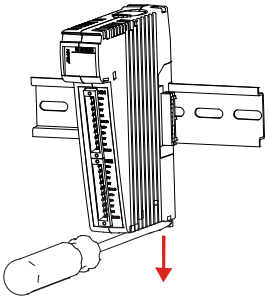
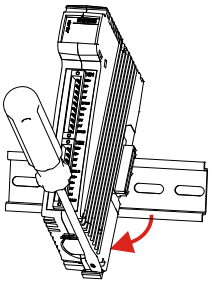
Related Topics:

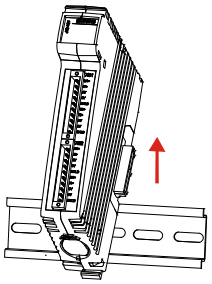
- **Installing JX3 Peripheral Modules on a DIN Rail** on page 36
- **Removing a JX3 Peripheral Module from the DIN Rail** on page 39

Removing a JX3 Peripheral Module from the DIN Rail

Removing

To remove a JX3 peripheral module from a rail to DIN EN 50022 proceed as follows:

Step	Action
1	Remove power from the JX3 station.
2	Slide the adjacent JX3 peripheral modules aside. By doing so, the JX3 backplane to the other JX3 peripheral modules is disconnected. 
3	Pull down the DIN rail latch. 
4	Swing the lower part of the JX3 peripheral module forward. 

5	Remove the JX3 peripheral module from the DIN rail. 

Related Topics:

- **Installing JX3 Peripheral Modules on a DIN Rail** on page 36
- **Replacing a JX3 Peripheral Module** on page 37

4 First Commissioning

Purpose of this Chapter

This chapter deals concisely with the first commissioning procedure of the JX3-DMS2 module. The following function is to serve as an example:

- Parametering input 1 and input 2 by means of a JetSym setup pane.

Prerequisites

For first commissioning the JX3-DMS2 module, the following requirements have to be met:

- The JX3-DMS2 module is connected to a JetControl device.
- The controller is linked with a PC.
- On the PC, the JetSym programming software has been installed.
- The minimum requirements regarding module, controllers and software have been met.
- A sensor has been connected to the channel that is to be measured.

Table of Contents

Preparing First Commissioning

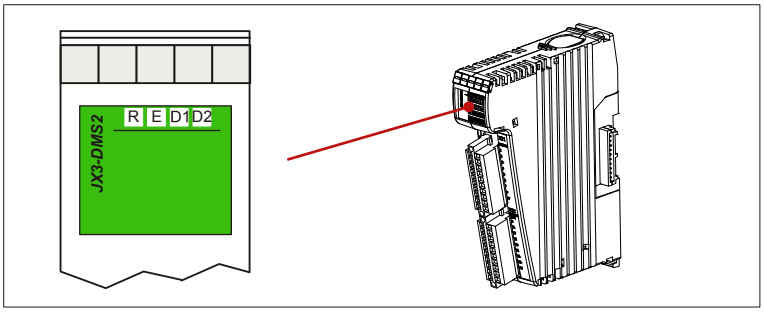
Behavior After Power-Up

The output voltage of 5 V at X61.UV1+ to X61.UV1- and X62.UV2+ against X62.UV2- is activated automatically.

For using the JX3-DMS2 module adequately, configuration via software is required. The sensitivity of the module has been pre-set to 3.5 mV/V on both channels.

State of the LEDs

The LEDs of the JX3-DMS2 module have got the following states after power-up:



R	E	D1	D2	1...16	Normal Operating Condition
ON	OFF	OFF	OFF	-	No error, communication is active

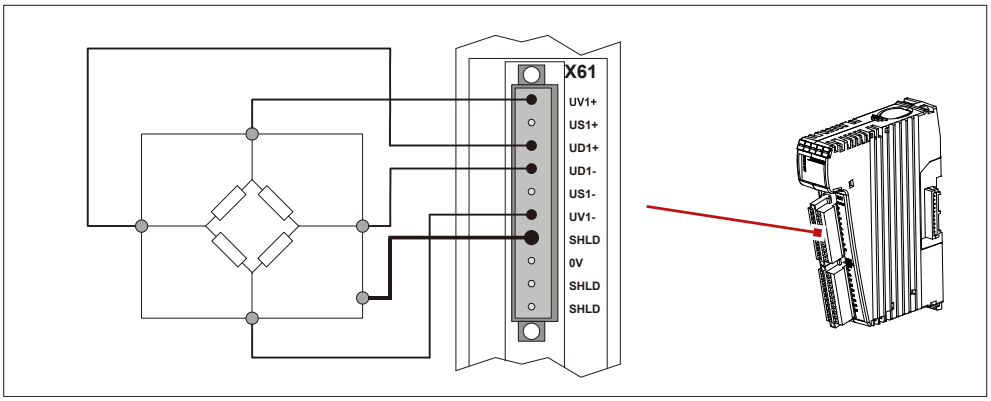
Connection of the Sensor

Connect terminal point X61.UV1+ with the connection of sensor Excitation+, and terminal point X61.UV1- with the connector of sensor Excitation-.

Connect terminal point X62.UV2+ with the connection of sensor Excitation+, and terminal point X62.UV2- with the connector of sensor Excitation-.

Note!

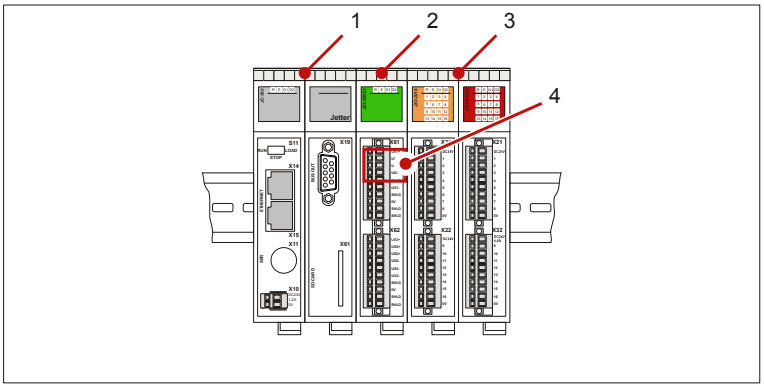
The designations of sensor connections can differ from the designations of the terminals.



First Commissioning by a JC-3xx

Configuration

The first commissioning procedure is based on the following configuration:



Number	Component	Function
1	JC-3xx	Controller
2	JX3-DMS2	Analog input module, module number 2
3	JX3 modules	Further JX3 modules of the JX3 station
4	X61	Terminal for analog input

Determining the Register Number

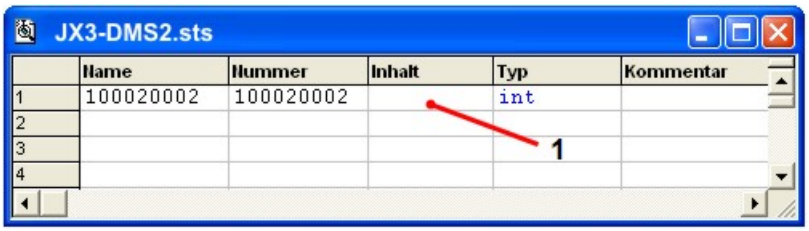
The value of analog input IN 1 has been assigned to module register MR 2. This register number consists of the following digits:

1	0	0	m	m	0	0	0	2

Component	Function
mm	Module number of the module in the JX3 station: here 02

Recording a Reading via JetSym

Measure a strain gage value via the JetSym setup and register number 3002:

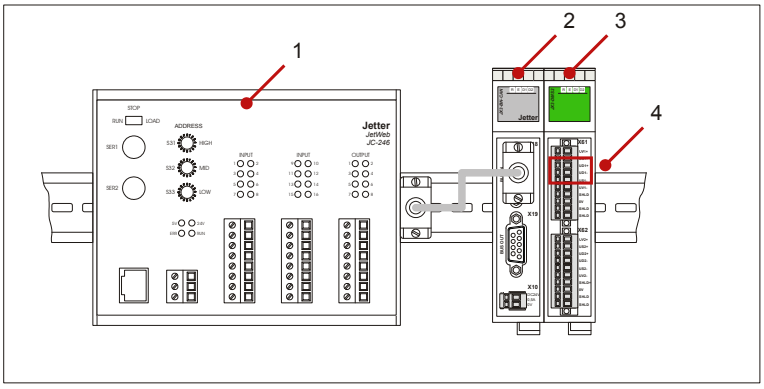


Number	Component	Values
1	New value for analog input of channel 1	Depending on scaling and sensor

First Commissioning by a JC-24x

Configuration

The first commissioning procedure is based on the following configuration:



Number	Component	Function
1	JC-24x	Controller
2	JX3-BN-CAN	Bus head for JX2 system bus
3	JX3-DMS2	Analog measuring module: I/O module number 2
4	X61	Terminal for sensor 1

Determining the Register Number

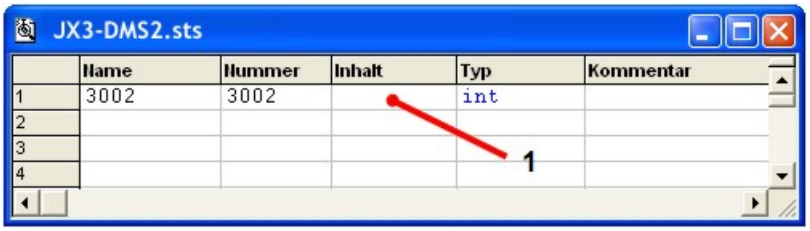
The value of analog input IN 1 has been assigned to module register MR 2. This register number consists of the following digits:

3	x	x	2

Component	Function
xx	I/O module number of the module on the system bus - 2 here: xx = 00

Output of the Reading of Channel 1

Read the value of channel 1 via the JetSym setup and register number 3002:



Number	Component	Values
1	Reading of channel 1	-32,768 .. 32,767 as an ADC direct value, otherwise value multiplied by scaling factor

5 Programming

Objective of this Chapter

This chapter supports programming the JX3-DMS2 module in the following aspects:

- Determining register numbers dependent on the system configuration
- Output of voltages and currents
- Function and programming of additional functions

Prerequisites

For programming the JX3-DMS2 module, the following requirements have to be met:

- The JX3-DMS2 module is connected to a JetControl device.
- The controller is linked with a PC.
- On the PC, the JetSym programming software has been installed.
- The minimum requirements regarding module, controllers and software have been met.

Contents

Abbreviations, Module Register Properties and Formats

Abbreviations

The abbreviations used in this document are listed in the following table:

Abbreviation	Meaning
R 100	Register 100
MR 150	Module register 150

Module Register Properties

Each module register is characterized by certain properties. For many module registers most properties are identical. For example, their value after reset is 0. In the following description, module register properties are mentioned only if a property deviates from the following default properties.

Module Register Properties	Default property for most module registers
Access	Read / write
Value following a reset	0 or undefined (e.g. release number)
Takes effect	Immediately
Write access	Always
Data type	Integer

Number Formats

The number formats used in this document are listed in the following table:

Notation	Number Format
100	Decimal
0x100	Hexadecimal
0b100	Binary

JetSym Sample Programs

The notation for sample programs used in this document is listed in the following table:

Notation	Meaning
`Var, When, Task`	Key words
`BitClear();`	Instructions
`100 0x100 0b100`	Constant numerical value
`// This is a comment`	Comments
`// ...`	Further program processing

5.1 Register and I/O Numbering for JX3 Modules

Introduction

The modules supplied by Jetter AG can carry out a great number of functions which can be called up by the user via registers. Each register and each digital input or output has been designated by an unambiguous number.

Usage: Register Number

Register numbers are used in the following cases:

- A module register is to be read or written in the Setup section of JetSym.
- A module register is to be declared as a variable in the application program of JetSym.
- A module register is to be declared as a tag in JetViewSoft.

Usage: I/O Number

I/O numbers are used in the following cases:

- A digital input is to be read in the Setup section of JetSym.
- A digital output is to be read or written in the Setup section of JetSym.
- A digital input or output is to be declared as a variable in the application program of JetSym.
- A digital input or output is to be declared as a tag in JetViewSoft.

Contents

Registers and Module Registers

Definition: Module Registers

By means of module registers, process, configuration and diagnostic data can be read by the JX3-DMS2 module, respectively written to the module. The module register number is unambiguous within the respective module.

Definition: Registers

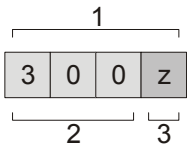
Registers can be accessed directly in the application program of the controller, in a setup pane of JetSym, or via the user interface directly. The register number is unambiguous within the respective system.

Example: Module Register

Via module register 9, the up-to-date operating system version of a JX3-AI4 can be accessed.

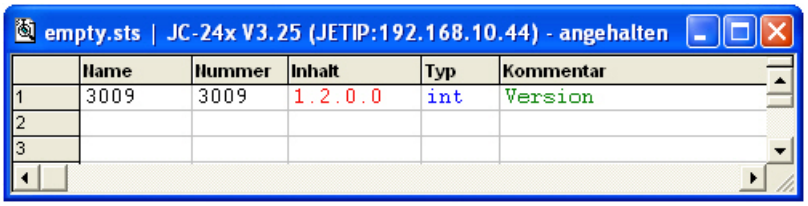
Example: Register

A JX3-AI4 module has been connected to the system bus of a JC- 24x by a JX3-BN-CAN bus head. The module has got I/O module number 2.



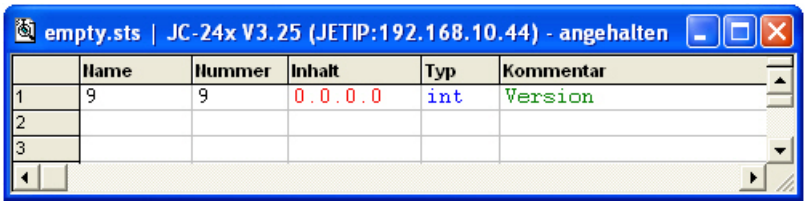
No.	Component	Function
1	Register number	Can be used immediately
2	Register prefix	300: for JX3 modules at the system bus of a JC-24x
3	Module register number	z = 9: OS version

In the setup pane of JetSym, the operating system version 1.2.0.0 can be read out via register number 3009 directly.



Counterexample: Module Register

If in the setup pane of JetSym number 9 is entered, the operating system version is not read out.



I/O Module Numbers in the JX2 System Bus

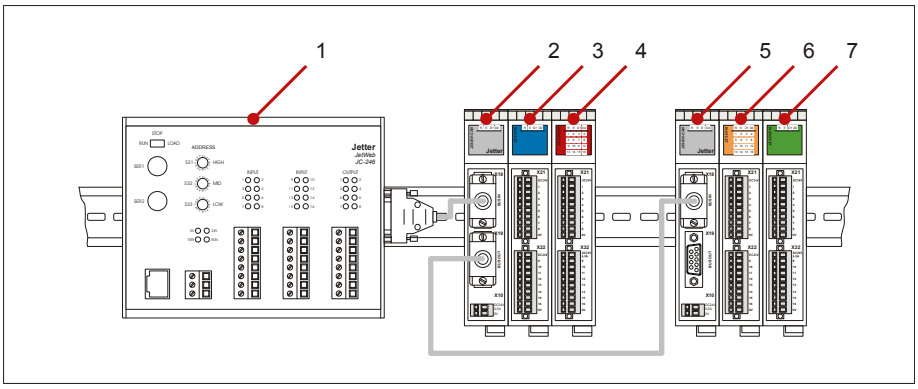
I/O Module Number

Each module in the JX2 system bus is assigned an I/O module number for clear identification. The I/O module number is dependent on the position of the module on the JX2 system bus. Assigning this module number is carried out according to the following rules:

- The controller has always got I/O module number 1.
- JX3-BN-CAN modules are counted separately.
- The first JX3-BN-CAN is assigned I/O module number 33.
- The JX2-PS1 and JX3-PS1 modules are not assigned an I/O module number.
- The first non-intelligent JX2, respectively JX3 module is assigned I/O module number 2.
- Intelligent JX2 modules, e.g. JX2-SV1, are not assigned an I/O module number.

Example: I/O Module Numbering

Several JX3 modules have been connected to a JC-24x controller via JX2 system bus.



Number	Module	I/O Module Number
1	JC-24x	1
2	JX3-BN-CAN	33
3	JX3-AO4	2
4	JX3-DIO16	3
5	JX3-BN-CAN	34
6	JX3-DI16	5
7	JX3-AI4	6

Register and I/O Numbers with JC-24x and JM-D203-JC-24x

Register Numbers for JX3 Modules

The register number for JX3 modules with JC-24x and JM-D203-JC-24x is composed as follows:

3	x	x	z

Element	Meaning	Value Range
xx	I/O module number in the JX2 system bus - 2	0 ... 30
	At the bus head JX3-BN-CAN	31 ... 61
z	Module register number	0 ... 9

I/O Numbers for JX3 Modules

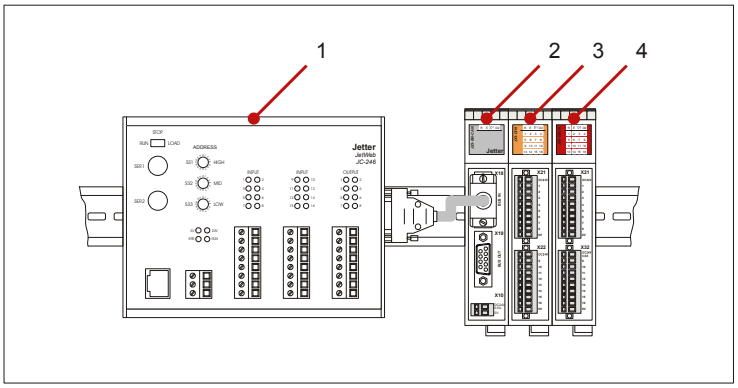
The I/O number for JX3 modules with JC-24x and JM-D203-JC-24x is composed as follows:

x	x	z	z

Element	Meaning	Value Range
xx	I/O module number in the JX2 system bus	2 ... 32
zz	I/O number of the module	1 ... 16

Example

Several JX3 modules have been connected to a JC-24x controller.



Number	Module	I/O Module Number	Register	I/O
1	JC-24x	1	0 ... 1999	101 ... 116
2	JX3-BN-CAN	33	3310 ... 3319	-
3	JX3-DI16	2	3000 ... 3009	201 ... 216
4	JX3-DIO16	3	3010 ... 3019	301 ... 316

Register and I/O Numbers with JC-3xx

Module Numbers of a JX3 Station

The module numbers within a JX3 station are determined as follows:

- The figures of the module numbers are counted from left to right, starting with 1.
- The power supply module JX3-PS1 is not assigned a module number.

Register Numbers for JX3 Modules

The register number for JX3 modules with JC-3xx is composed as follows:

1	0	0	m	m	z	z	z	z

Element	Meaning	Value Range
mm	Module number of the module in the JX3 station	02 ... 18
zzzz	Module register number	0000 9999

I/O Numbers for JX3 Modules

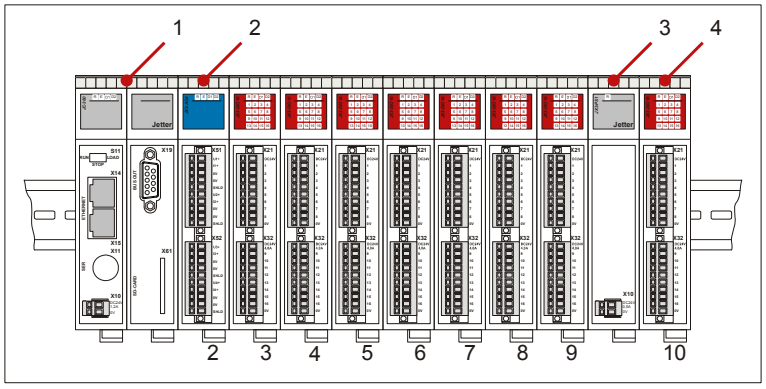
The I/O number for JX3 modules with JC-3xx is composed as follows:

1	0	0	0	0	m	m	z	z

Element	Meaning	Value Range
mm	Module number of the module in the JX3 station	02 ... 18
zz	I/O number of the module	1 ... 16

Example

Several JX3 modules have been connected to a JC-3xx controller.



Number	Module	Module Number	Register	I/O
1	JC-3xx	1	see JC-3xx documentation	
2	JX3-AO4	2	10002zzzz	1000002zz
3	JX3-PS1	-	-	-
4	JX3-DIO16	10	10010zzzz	1000010zz

Register and I/O Numbers for JC-647 with JX6-SB(-I)

Register Numbers for JX3 Modules

The register number for JX3 modules with JC-647 and JX6-SB(-I) is composed as follows:

3	m	0	3	x	x	z

Element	Meaning	Value Range
m	Submodule socket	1 ... 3
xx	I/O module number on the JX2 system bus - 2	0 ... 30
	at the bus head JX3-BN-CAN	31 ... 61
z	Module register number	0 ... 9

I/O Numbers for JX3 Modules

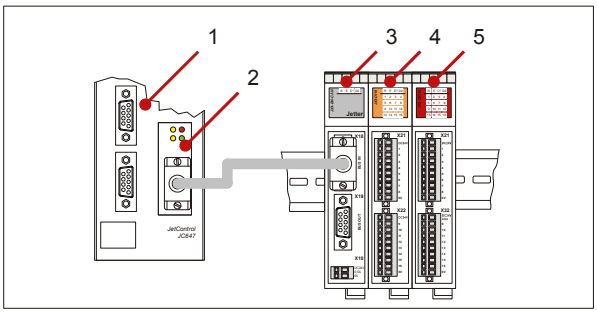
The I/O number for JX3 modules with JC-647 and JX6-SB(-I) is composed as follows:

m1	x	x	z	z

Element	Meaning	Value Range
m1	Submodule socket + 1	2 ... 4
xx	I/O module number on the JX2 system bus	2 ... 32
zz	I/O number of the module	1 ... 16

Example

Several JX3 modules have been connected to a JC-647 controller with a JX6-SB(-I) submodule.



Number	Module	I/O Module No.	Registers	I/O
1	JC-647	-	Module slot: 1	
2	JX6-SB	-	Submodule socket: 1	
3	JX3-BN-CAN	33	3103310 ... 3103319	-
4	JX3-DI16	2	3103000 ... 3103009	20201 ... 20216
5	JX3-DIO16	3	3103010 ... 3103019	20301 ... 20316

Register and I/O Numbers for JC-800 with JX6-SB(-I)

Register Numbers for JX3 Modules

The register number for JX3 modules with JC-800 and JX6-SB(-I) is composed as follows:

4	C	M	0	3	x	x	z

Element	Meaning	Value Range
C	Module board number	1 ... 3
M	System bus module	1 ... 2
xx	I/O module number on the JX2 system bus - 2	0 ... 30
	At the bus head JX3-BN-CAN	31 ... 61
z	Module register number	0 ... 9

I/O Numbers for JX3 Modules

The I/O number for JX3 modules with JC-800 and JX6-SB(-I) is composed as follows:

5	2..3	C	M	x	x	z	z

Element	Meaning	Value Range
2..3	Input	2
2..3	Output	3
C	Module board number	1 ... 3
M	System bus module	1 ... 2
xx	I/O module number on the JX2 system bus	2 ... 32
zz	I/O number of the module	1 ... 16

5.2 Register Access to JX3 Modules on the JX2 System Bus

Introduction

Each JX3 module supports over 10,000 module registers. At the JX2 system bus, access to the 10,000 module registers is made via 10 registers. Eight module registers can directly be accessed by entering a register number. The remaining 9,992 module registers can be accessed in indirect mode via an index register and a value register.

Direct Register Access

The following module registers have been assigned to register numbers directly.

- Status
- Command
- Process data
- Operating system, respectively firmware version

Indirect Register Access

Any remaining module registers of the JX3 module can only be accessed in indirect mode via an index register and a value register.

Contents

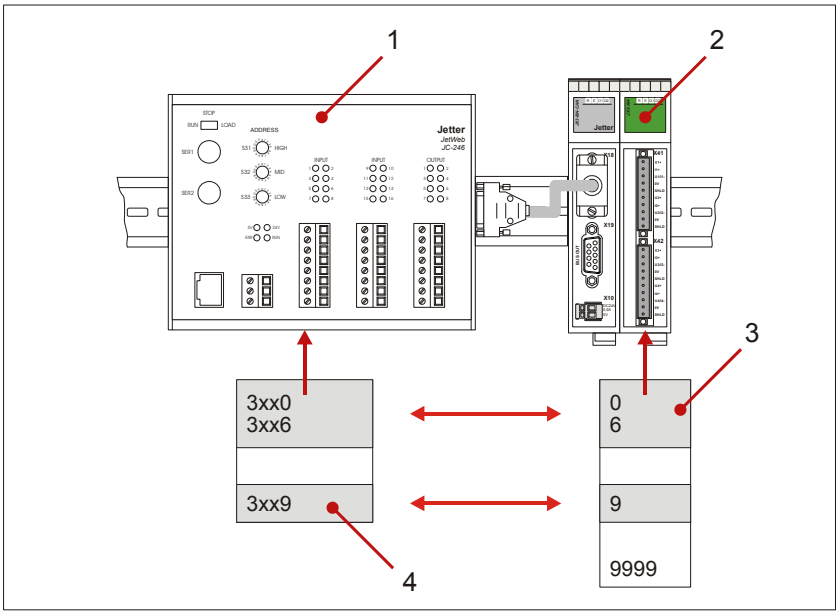
Direct Register Access to JX3 Modules in the JX2 System Bus

Direct Register Access

At direct register access, a module register of the module is directly assigned to a register number. Via this register, the value of the module register can be read and written.

Assignment of the Register Numbers

At direct register access, the module registers have been assigned to the register numbers as follows:



Number	Component	Function
1	JC-24x	Controller
2	JX3-AI4	JX3 module with 10,000 module registers
3	Module registers	Module register numbers of the JX3 module for direct access
4	Register numbers	Register numbers of the controller for direct access

Survey of Direct and Indirect Module Registers

In the following table, the module registers are shown which can be accessed in the JX2 system bus either in direct or in indirect mode.

Module Register Number	Direct	Indirect
0 ... 6	✓	
7 ... 8		✓
9	✓	
10 ... 9,999		✓

Example: Direct Register Access

Purpose of this Example

This example is to illustrate how module registers are written into directly. The exact function of the power supply used is not relevant.

Task

At a JX3-DIO16, the power supply of the digital outputs are to be controlled at the terminal point X32.DC24V. At a failure of the power supply, an error routine is to be carried out.

Solution

In MR 0 of the JX3-DIO16, a checkup is made if bit 2 has been cleared. After this, the error routine is carried out.

Configuration

The example is based on the following configuration:

Number	Component	Function
1	JC-24x	Controller
2	JX3-BN-CAN	Bus head for JX2 system bus I/O module number 33
3	JX3-DIO16	Digital I/O module I/O module number 2

JetSym ST Program

```
Var
    // Status register
    State : Int At %VL 3000;
End_Var;

Task 0
    // wait, until power is zero
    When
        BIT_CLEAR(State, 2)
    Continue;
    // Error routine
End_Task;
```

Indirect Register Access to JX3 Modules on the JX2 System Bus

Overview of Registers

At indirect register access, the following module registers are used:

Registers	Description
MR 7	Index for indirect register access
MR 8	Value for indirect register access

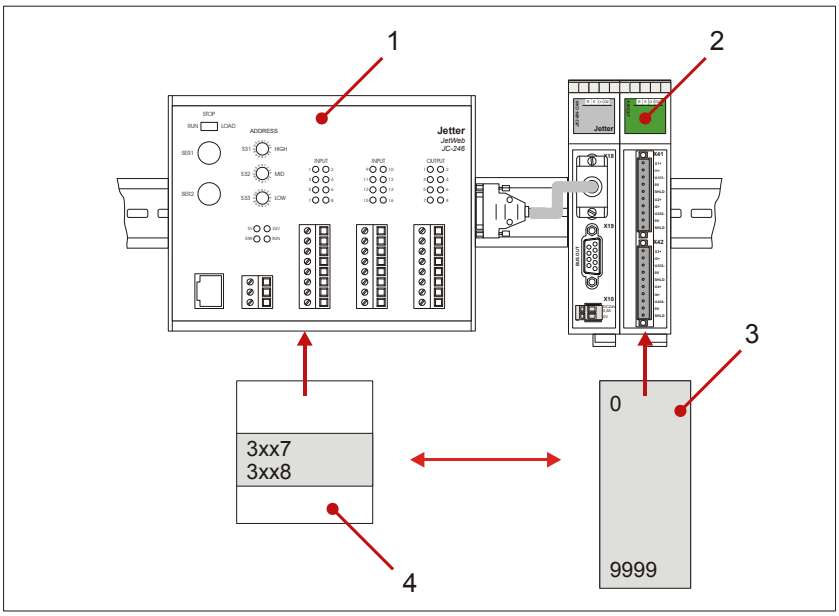
Indirect Register Access

The indirect register access to a module register is carried out via an index and a value register in two steps.

Step	Action
1	Write the number of the module register into MR 7 *Index for Indirect Register Access*.
2	Read, respectively write, the value of the module register, via MR 8 *Value for Indirect Register Access*.

Assignment of the Register Numbers

At indirect register access, the module registers have been assigned to the register numbers as follows:



Number	Component	Function
1	JC-24x	Controller
2	JX3-AI4	JX3 module with 10,000 module registers
3	Module registers	Module register numbers of the JX3 module for indirect access
4	Register numbers	Register numbers of the controller for indirect access

Survey of Direct and Indirect Module Registers

In the following table, the module registers are shown which can be accessed either in direct or in indirect mode:

Module Register Number	Direct	Indirect
0 ... 6	✓	
7 ... 8		✓
9	✓	
10 ... 9,999		✓

Rules Applying to Indirect Register Access

Please make sure at indirect register access, that MR 7 *Index for Indirect Register Access* is not overwritten by another source.

Please keep to the following rules when applying indirect register access to JX3 modules:

- In the application program, the registers may only be accessed within one task.
- Simultaneous register access from various sources is not permitted.

Possible sources are:

- Various tasks of the application program in the controller
- JetSym setup
- Visualization

Related Topics:

- **Register Description for Indirect Register Access** on page 60
- **Example: Indirect Register Access** on page 59

Example: Indirect Register Access

Purpose of this Example

This example is to illustrate how module registers are written into in indirect mode. The exact function of the digital filters used is not relevant.

Task

On a JX3-DIO16, the digital filters of the inputs IN1 to IN4 are to be set to 16 ms.

Solution

Via MR 263, the filter time is set to 16 ms. Then, the filters are activated via MR 262. All module registers can be accessed in indirect mode.

Configuration

The example is based on the following configuration:

Number	Component	Function
1	JC-24x	Controller
2	JX3-BN-CAN	Bus head for JX2 system bus I/O module number 33
3	JX3-DIO16	Digital I/O module I/O module number 2

JetSym ST Program

```
Var
    // Index Register
    Index : Int At %VL 3007;
    // Value Register
    Data  : Int At %VL 3008;
End_Var;

Task 0
    // Set index register to MR 263
    Index := 263;
    // Write value 7 to filter time in indirect mode in MR 263
    Data := 7;

    // Set index register to MR 262
    Index := 262;
    // Activate filter for IN 1 .. IN 4 in MR 262
    BIT_SET(Data, 0);
    BIT_SET(Data, 1);
    BIT_SET(Data, 2);
    BIT_SET(Data, 3);

    // ...
End_Task;
```

Module Registers for Indirect Register Access

MR 7

Index for Indirect Register Access

Via MR 7, a module register number for indirect register access is specified.

Module Register Properties	
Values	0 .. 9,999
Value after reset	9

MR 8

Value for Indirect Register Access

Via MR 8, a module register value is read or written.

Module Register Properties	
Values	Dependent on the specified module register number in MR 7

5.3 Reading of Voltages

Introduction

This chapter describes the procedure of measuring voltages at the analog inputs.

Applications

The following applications are possible:

- Measuring of analog sensors in a bridge circuit

Independence of Analog Outputs

Each analog input can be configured and operated individually. It is independent of the other analog input. The time behavior of each analog input, though, depends on the time behavior of the corresponding output. This means that not all time settings of one output can be independent from the settings of the other output.

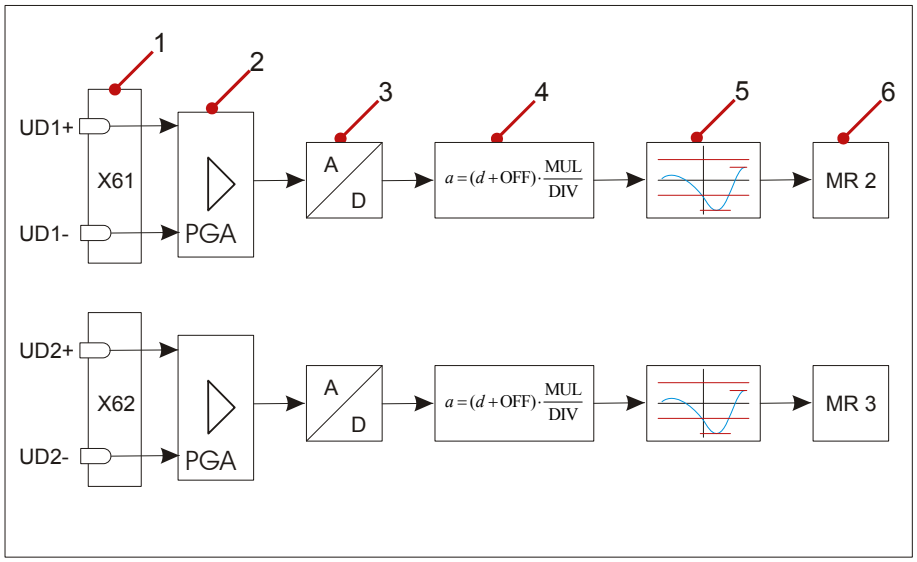
Table of Contents

Converting Analog Values into Digital Values

Step-by-Step Conversion

The JX3-DMS2 module converts the analog values into digital values step by step.

Each analog output is treated individually during this process.



Step	Description
1	Input for the differential mode voltage at terminals X61 and X62
2	Programmable amplifier - it can indirectly be set by means of the sensor sensitivity
3	Converting the analog value
4	Conversion to scaled unit
5	Trailing indicator and limitation
6	Output of new unit after conversion, e.g. pressure in [bar], proportional to the voltage at the difference input

Related Topics

- **User-Scaling** on page 65
- **Monitoring of Limits** on page 78
- **Trailing Indicator** on page 80
- **Forcing of Analog Inputs** on page 82

5.4 Additional Features

Introduction

For each analog input, various additional features can be configured.

Applications

The following applications can be carried out with the help of additional features:

- Measuring physical quantities. The measured analog value is converted into a physical quantity on the JX3-DMS2 module.
- Evaluation of the greatest torsion occurring at making a shaft rotate.
- Checking for overpressure.
- The behavior of the connected sensor can be simulated during commissioning.
- By means of the oscilloscope function, values of various module registers can be recorded.
- etc.

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5.4.1 User-Defined Scaling

Introduction

User-defined scaling offers the possibility to work with physical quantities. The analog value is converted into an apt physical quantity on the JX3-DMS2 module.

Applications

The following applications can be carried out with the help of user-defined scaling:

- Setting the pressure value for a pneumatic valve
- Setting the weight for a weighing cell in pounds or ounces
- etc.

Module Registers with Physical Quantities

The following module registers contain a physical quantity at active user-defined scaling:

- MR 2 and 3: Value depending on the physical quantity
- MR 1y08 and MR 1y09: Upper and lower limit
- MR 1y20 and MR1y21: Upper and lower trailing indicator

Interaction with the Analog Inputs

User-defined scaling can be configured for each analog input individually. Due to the versatility of the JX3-DMS2 module, user-scaling is a must. This means that, at first commissioning, an initial scaling has to be carried out as well. At each new startup, scaling has to be carried out again, as on module-level, the memories are non-remanent.

Contents

Function of User Scaling

Behavior after Power-up

After power-up, user-scaling is active. The module registers show initial values that have to be changed by the user.

Calculations at Voltage Output

The voltages being output at the analog output are calculated by the following formula:

$$y_n = x \cdot \frac{MUL}{DIV} + OFFSET$$

Element	Function
yn	Displayed measuring value
x	Actual measuring value
OFFSET	Internal offset for calculation
MUL	Internal multiplier for calculation
DIV	Internal divisor for calculation

Operating Principle

User-scaling is carried out taking the following steps:

Step	Description
1	Recording the analog reading x as a 16-bit value
2	Multiplication by factor MUL The intermediate result is a 32-bit value
3	Division by divisor DIV The result is a 32-bit value
4	Addition of an OFFSET to digital value dy The intermediate result is a 32-bit value
5	Output of the analog value ay of channel 1 in MR 2, respectively the value of channel 2 in MR 3

Related Topics

- **Register Description: User-Defined Scaling** on page 68
- **Example: Scaling a Pressure Value via JC-3xx** on page 72
- **Example: Scaling a Pressure Value via JC-24x** on page 74

Configuration of User Scaling

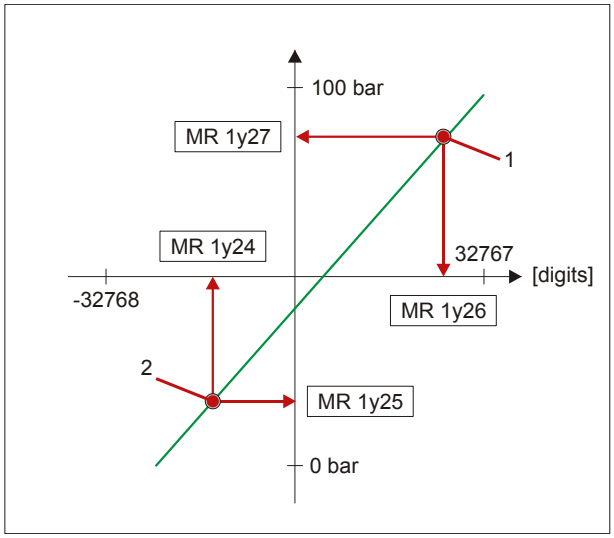
Overview of Registers

For configuration of user-scaling, the following module registers are used:

Register	Description
MR 1y24	1. Digital value for the input signal (minimum)
MR 1y25	1. Value of the physical variable (minimum)
MR 1y26	2. Digital value for the input signal (maximum)
MR 1y27	2. Value of the physical variable (maximum)

Point Pairs of User-Defined Scaling

Configuration of user-defined scaling is carried out by defining two pairs of points. Each pair of points consists of a value within a physical unit and a digital value.



Number	Element
1	First pair of points
2	Second pair of points

Configuration of User-Defined Scaling

Carry out the following steps for the configuration of user-defined scaling:

Step	Action
1	Enter the smallest value of the physical value into MR 1y25.
2	By command 210 in MR 1y01, the corresponding digital value is assigned to the smallest value.
3	Enter the greatest value of the physical value into MR 1y27.

4	By command 220 in MR 1y01, the corresponding digital value is assigned to the greatest value. Now, the conversion formula applied by the JX3-DMS2 module is scaled correctly. **Result:** The user-scaling function calculates the correct result in the respective physical unit.
5	Adjustment towards zero of the display

Related Topics

- **Register Description: User-Defined Scaling** on page 68
- **Example: Scaling a Pressure Value via JC-3xx** on page 72
- **Example: Scaling a Pressure Value via JC-24x** on page 74

Register Description: User-Defined Scaling

Sensitivity of the Sensor

The sensitivity is entered into MR 1y11 in µV/V. In order to make full use of the dynamic range of the AD converter, the JX3-DMS2 module generates the reciprocal of the sensitivity value:

$$V = \frac{\text{maximum input voltage ADC}}{\text{maximum supply voltage} \bullet \text{sensitivity}}$$

Example

A weighing-cell has got a sensitivity of 5.2 mV/V.

The sensor is fed with 5 V by the JX3-DMS2 module. This means that the maximum voltage to be measured at the differential outputs of the sensor is

$$V = \frac{5\ V}{5\ V \cdot 5.2\ mV/V} = 192.31$$

Not all amplification factors can be set exactly.

The amplification factor is internally set to

V = 191.666

In module register 1y17, the amplification value can be controlled. The actual value has been multiplied by factor 1,000.

The sensitivity of the sensor is entered into module register 1y11 in the unit µV/V.

You can also enter a sensitivity value of the strain gage differing from the manufacturer's specification into MR 1y11.

The final result will not be influenced by the scaling that follows. This way, the response of a sensor can be changed.

Our example:

Sensitivity	5.2 mV/V = 5,200 µV/V
MR 1y11	5,200

MR 1y11

Sensor Sensitivity in µV/V

Module Register Properties		
Values	0	400,000,000
Value after reset	3,500	

MR 1y06

Number of Averaging Cycles

The JX3-DMS2 module determines the moving average separately for each analog input. With each incoming digitized reading the average of the last n measurements is determined (n = number of averaging procedures). Averaging is carried out before calculating the user-scaling.

Averaging results in a higher accuracy of the analog input signal. Short input signal peaks result only in slight changes in the value contained in module registers 2 and 3. The averaging function works like a filter.

Averaging can be configured separately for each analog input. When the configuration is changed, the data of the analog input become invalid. Bit 16 of the *collective bit Validity* in register 0 *Module State* is reset. Averaging starts anew.

Module Register Properties	
Values	1, 2, 4, 8, 16, 32, 64, 128
Value after reset	1 (no averaging)

MR 1y24

1st Digital Value for Analog Input y

The digital value of the first pair of points is stored to MR 1y25. The value can be read out of the register for controlling means.

At entering command 210 into module register 1y01, the value is updated in the register.

Module Register Properties	
Values	-32,768 ... +32,767
Value after reset	-32,768

MR 1y25

1st Value of the physical variable (minimum)

The physical (minimum) value of the first pair of points is entered into MR 1y25.

Module Register Properties	
Values	Physical value
Value after reset	-2,147,483,648 ... +2,147,483,647

MR 1y26

2nd Digital Value for Analog Input y

The digital value of the second pair of points is stored to MR 1y26. The value can be read out of the register for controlling purposes.

At entering command 220 into module register 1y01, the value is updated in the register.

Module Register Properties	
Values	-32,768 ... +32,767
Value after reset	32,767

MR 1y27

2nd Value of the Physical Variable (Maximum)

The physical (maximum) value of the second pair of points is entered into MR 1y27.

Module Register Properties	
Values	Physical value
Value after reset	-2,147,483,648 ... +2,147,483,647

MR 1y28

Offset of the Straight Line (t, at Equation of the Line: y = mx + t) for Scaling

The offset of the straight line is entered into MR 1y28.

Module Register Properties	
Values	Physical value
Value after reset	-2,147,483,648 ... +2,147,483,647

MR 1y29

Offset of the Actual Value (similar to tare function with scales).

The offset of the actual value is entered into MR 1y29.

Module Register Properties	
Values	Physical value x factor 1,000,000
Value after reset	-2,147,483,648 ... +2,147,483,647

MR 1y01

Command

The command to start measuring the minimum and maximum value is entered into MR 1y01.

Module Register Properties	
Values	210, 220

Example: Scaling a Pressure Value via JC-3xx

Task

A pressure sensor has got a sensitivity of 12.5 mV/V. The maximum pressure in the system is 22 bar.

The pressure sensor can measure values up to 30 bar.

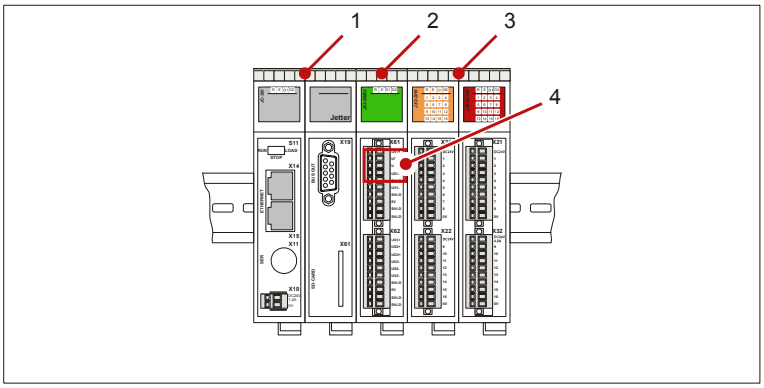
Solution

User-defined scaling on the JX3-DMS2 module is configured in a way that the pressure is directly output in millibar as a digital value. Configure user-defined scaling by defining the following pairs of points:

Reading
MR 1y25 := 0 [mBar]
MR 1y27 := 22,000 [mBar]

Configuration

This example is based on the following configuration:



Number	Element	Function
1	JC-3xx	Controller
2	JX3-DMS2	JX3-DMS2 module
3	JX3-xxx	Further JX3 modules
4	X51	Terminal for connecting the proportional valve

Processing the Example Program

The example program is processed in the following sequence:

Step	Description
1	Configuration of the sensor sensitivity
2	Configuration of the first pair of points
3	Configuration of the second pair of points
4	Adjustment towards zero (Tare function)

JetSym STX Program

```
// Type declaration of the module registers
Type
    TYPE_JX3_DMS2:
    Struct
        // Digital value for analog input MR2 and MR3
        Result_CH1          : Float At 2*4;
        Result_CH2          : Float At 3*4;
        // Sensitivity of channel 1
        Sensitivity_CH1      : Int At 1111*4;
        // Number of averaging procedures
        Averaging_CH1    : Int At 1106*4;
        // User-defined scaling of the minimum pressure value
for channel 1
        DigitalValueMin_CH1 : Int At 1124*4;
        ScalingMin_CH1 : Int At 1125*4;
        // User-defined scaling of the maximum pressure value of
channel 1
        DigitalValueMax_CH1 : Int At 1126*4;
        ScalingMax_CH1 : Int At 1127*4;
    End_Struct;
End_Type;

Var
    // Variable declaration of module JX3-DMS2
    JX3DMS2_02 : TYPE_JX3_DMS2 At %VL 100020000;
End_Var;

Task main Autorun
    // Configuration of the sensitivity in µV/V of channel 1:
    // 12.5 mV/V * 1,000 = 12,500 µV/V
    JX3DMS2_02.Sensivity_CH1 := 12500;
    // Number of averaging procedures (which has to be a
multiple of 2^n:
    // 1, 2, 4, 8)
    JX3DMS2_02.Averaging_CH1 := 128;

    // Scaling Y_min, Y_max
    // 0 bar min.
    JX3DMS2_02.ScalingMin_CH1 := 0;
    // 22 bar max.; value in mbar
    JX3DMS2_02.ScalingMax_CH1 := 22000;
    // enter previously determined digital values.
    //These can also be determined by means of command 210, 220.
    // Scaling X_min, X_max
    JX3DMS2_02.DigitalValueMin_CH1 := -8567;
    JX3DMS2_02.DigitalValueMax_CH1 := 14187;
End_Task;
```

Example: Scaling a Pressure Value via JC-24x

Task

By means of a pneumatic pressure sensor, a pressure of 0 to 80 bar is to be set. The pressure sensor has got a sensitivity of 3.2 mV/V.

The maximum pressure of the pick-up is 100 bar.

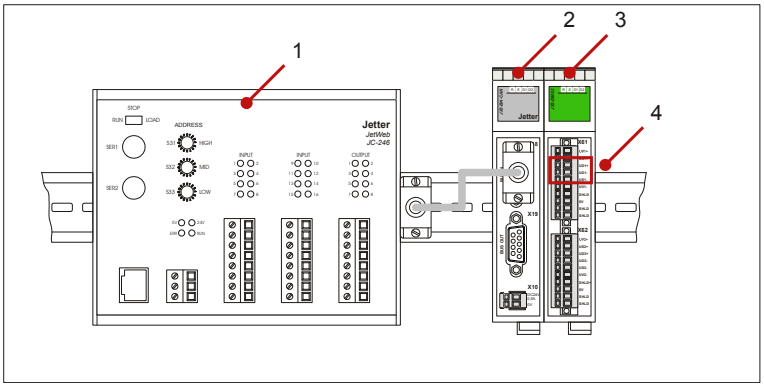
Solution

User-defined scaling on the JX3-DMS2 module is configured in a way that the pressure is directly output in bar as a digital value. Configure user-defined scaling by defining the following values:

Digital Value	Pressure Value
MR 1y24	MR 1y25 := 0 [bar]
MR 1y26	MR 1y27 := 80,000 [mbar]

Configuration

This example is based on the following configuration:



Number	Element	Function
1	JC-24x	Controller
2	JX3-BN-CAN	Bus head for JX2 system bus
3	JX3-DMS2	DMS Module: I/O module number 2
4	X61	Terminal for connecting the pressure valve

Processing the Example Program

The example program is processed in the following sequence:

Step	Description
1	Configuring the analog input sensitivity
2	Number of averaging procedures
3	Configuring the first pair of points
4	Waiting for confirmation
5	Configuring the second pair of points
6	The JX3-DMS2 module has been scaled to the sensor

JetSym ST Program

```
Var
    JX3DMS2 : Struct
        // State and command MR 0, MR 1
        State      : Int;
        Command    : Int;
        // Digital value of analog input MR 2 and MR 3
        AnalogIn_1 : int;
        AnalogIn_2 : int;
        // Dummy parameter in struct at position 4, 5, 6
        zz_Dummy1  : Int;
        zz_Dummy2  : Int;
        zz_Dummy3  : Int;

        // Registers for indirect register access: MR 7, MR 8
        Index      : Int;
        Data       : Int;
        // OS version MR 9
        Version    : Int;
    End_Struct At %VL 3000;

        JX6SB_Timeout     : Int At %VL 3102764;
        JC647_2SB_Timeout : Int At %VL 61802;
End_Var;



Task 0
        JX6SB_Timeout := 8;
        JC647_2SB_Timeout := 10;

    // Input configuration --
    // Set sensitivity in µV/V: 3.2 mV/V = 3200
    JX3DMS2.Index := 1111;
    JX3DMS2.Data  := 3200;


    // Set averaging to 4-fold
    JX3DMS2.Index := 1106;
    JX3DMS2.Data  := 4;

    When (JX3DMS2.State.16 = True) Continue;

    // Set the first point:
    // Lower limit is zero
    JX3DMS2.Index := 1125;
    JX3DMS2.Data  := 0;

    // Store pair of points.
    // The corresponding digital value is stored to 1124.
    JX3DMS2.Index := 1101;
```

```
    JX3DMS2.Data  := 210;

    // Wait for external confirmation that there is no pressure.

    When (JX3-DIO_IN.2 = True) Continue;

    // Set the second point:
    // 80,000 mbar equals 80 bar
    JX3DMS2.Index := 1127;
    JX3DMS2.Data  := 80000;

    // Wait for external confirmation that there is full
pressure,
    // that is, a manometer, for example, displays 80 bar.
    When (JX3-DIO_IN.3 = True) Continue;

    // Store pair of pointsPunktepaar.
    // The corresponding digital value is stored to 1126.
    JX3DMS2.Index := 1101;
    JX3DMS2.Data  := 220;

    // Wait for external confirmation that there is no pressure.
    When (JX3-DIO_IN.4 = True) Continue;

    // Activate 'Tare function'.
    // The value of module register 2 is reset to zero.
    JX3DMS2.Index := 1101;
    JX3DMS2.Data  := 230;

    // The module has been scaled to the sensor.

    //    ...
End_Task;
```

5.4.2 Limit Monitoring, Trailing Indicator, and Forcing

Introduction

For each analog input, an upper and lower limit has to be configured. The JX3-DMS2 module constantly checks, whether the digital value for the analog input exceeds or falls below the limits.

At each analog input, the JX3-DMS2 module saves the lowest and highest of the digital values measured at the respective analog input.

Applications

The following applications can be carried out with the help of the additional functions limit monitoring, trailing indicator, and forcing:

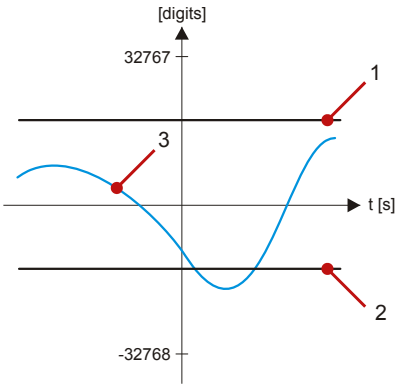
- Evaluation of the greatest throughput having been set at a proportional valve.
- Checking, whether a certain pressure value has been exceeded at a proportional valve.
- Forcing makes the simulation of sensors possible. This option allows also to test exceptional situations which do not occur during normal operation.
- etc.

Contents

Monitoring of Limit Values

Introduction

For each analog input, the user can set an individual limit. After calculating user-defined scaling, the JX3-DMS2 module constantly checks, whether the digital values for the analog input is within the limits.



Number	Element
1	Upper limit, MR 1y09
2	Lower limit, MR 1y08
3	Result of user-scaling calculation

Overview of Registers

To configure limit value monitoring, use the following module registers:

Register	Description
MR 0	Module state
MR 1y00	State of analog input y (y = 1 or 2)
MR 1y08	Lower limit value for analog output y (y = 1 or 2)
MR 1y09	Upper limit value for analog output y (y = 1 or 2)

Operating Principle

The JX3-DMS2 module checks the limit values in the following way:

Stage	Description
1	The module receives a new value in MR 2 und 3 *Digital Value of Analog Input y*.
2	The module performs user-defined scaling.

Stage	Description
3	The module compares the result of user-defined scaling with the limit values in MR 1y08 and 1y09. **If the result is ... / ... Then ...** < MR 1y08 → Bit 19 = 1 is set in MR 0, and Bit 19 = 1 is set in MR 1y00. > MR 1y09 → Bit 20 = 1 is set in MR 0, and Bit 20 = 1 is set in MR 1y00.

Configuration of Limit Value Monitoring

To configure limit value monitoring proceed as follows:

Step	Action
1	Setting the lower limit for the analog output in y MR 1y08.
2	Entering the upper limit for analog output y into MR 1y09.
3	**Result:** Now, the module JX3-DMS2 checks at regular intervals whether the digital value of the analog module is within the limits.

Acknowledgement of Values Exceeding the Limits

To acknowledge values exceeding the limits proceed as follows:

Step	Action
1	Delete bit 19, resp. bit 20 in MR 1y00 *State of Analog Input y*.
2	Delete bit 19, resp. bit 20 in MR 0 *Module State*.

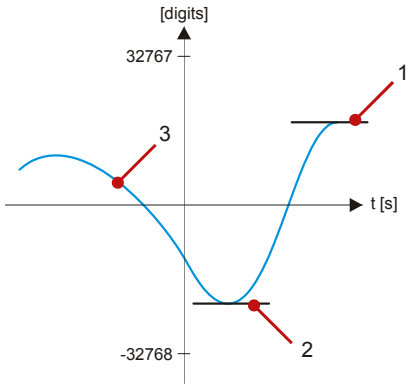
Related Topics

- **Register Description, Limit Monitoring, Trailing Indicator, and Forcing** on page 84

Trailing Indicator

Introduction

When user-scaling has been calculated, the JX3-DMS2 module checks the result. The lowest and highest digital value of the result is continually stored as a trailing indicator. The values of the trailing indicators get lost when the module is switched off.



Number	Element
1	Trailing indicator for peak value, MR 1y21
2	Trailing indicator for minimum value, MR 1y20
3	Result of user-scaling calculation

Overview of Registers

To monitor the trailing indicators, the following module registers are used:

Register	Description
MR 1y20	Trailing indicator: Minimum value of analog input y (y = 1 or 2)
MR 1y21	Trailing indicator: Maximum value of analog input y (y = 1 or 2)

Operating Principle

The JX3-DMS2 module checks the trailing indicators as follows:

Stage	Description
1	The module receives a new value in MR 2 and 3 *Digital Value of Analog Input y*.
2	The module performs user-scaling.
3	**If the result is ...** / **... Then ...** < MR 1y20 / MR 1y20 := result > MR 1y21 / MR 1y21 := result

Initializing the Trailing Indicators

After power-up, the JX3-DMS2 module initializes the trailing indicators for the minimum and maximum value automatically.

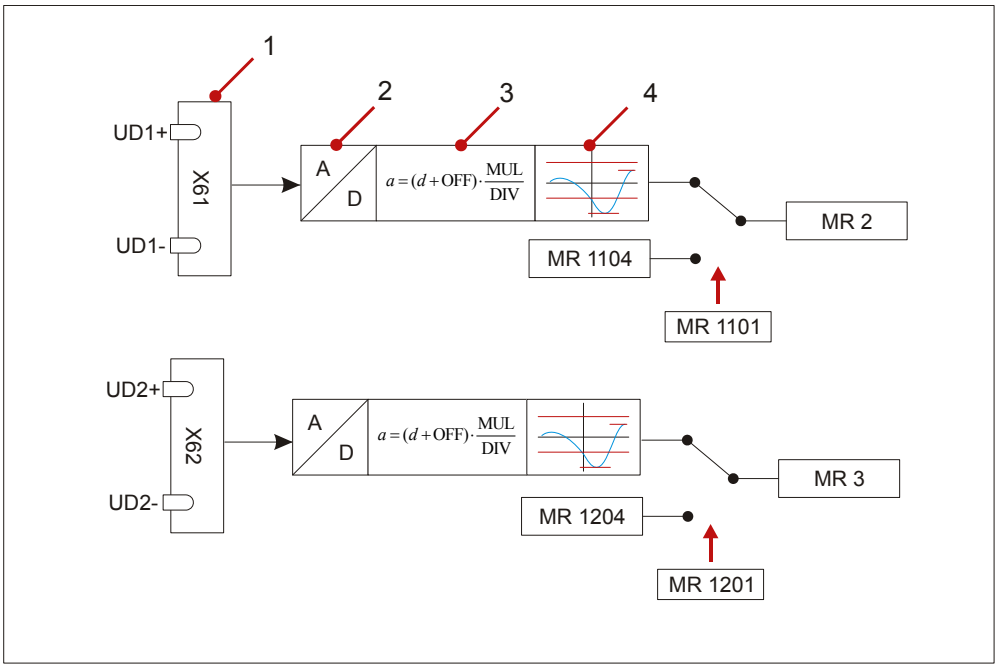
Related Topics

- **Register Description, Limit Monitoring, Trailing Indicator, and Forcing** on page 84

Forcing Analog Inputs

Introduction

At forcing the analog inputs, the JX3-DMS2 module outputs a configurable value as a digital value for the analog inputs. This value is independent from the reading of the channel.



Step	Description
1	Recording at the terminal and amplification of the input signal
2	AD conversion of the read value
3	Scaling the digitized read value
4	Output of the fixed value in MR 2 or MR 3, if forcing is called up via MR 1101, respectively MR 1201. Otherwise, the read value is displayed.

Overview of Registers

For monitoring the forcing process, the following module registers are used:

Register	Description
MR 1y00	State of Analog Input y (y = 1 or 2)
MR 1y01	Command for Analog Input y (y = 1 or 2)
MR 1y04	Force Value of Analog Input y (y = 1 or 2)

Activation of the Forcing Function

Activate the forcing procedure by taking the following steps:

Step	Action
1	Set the force value for the analog input y (x factor 1,000) via MR 1y04 *Force Value*
2	Activate the forcing function via MR 1y01 *Command for Analog Input y*. MR 1y01 := 171 **Result:** Bit 23 = 1 in MR 0 and MR 1y00. Forcing is carried out.

Deactivation of the Forcing Function

Deactivate the forcing procedure by taking the following steps:

Step	Action
1	Deactivate the forcing function via MR 1y01 *Command for Analog Output y*. MR 1y01 := 170 **Result:** Bit 23 = 0 in MR 0 and MR 1y00. Forcing is deactivated.

Related Topics

- **Register Description, Limit Monitoring, Trailing Indicator, and Forcing** on page 84

Register Description

MR 0

Module State

In MR 0 *Module State*, the module signalizes status and error messages of the module.

Meaning of the Individual Bits		
Bit 16	**Collective bit "Readings are valid"**	
	1 =	Both channels have got valid readings. The filter for a floating average per channel is filled.
Bit 19	**Collective bit "The lower limit has been fallen below"**	
	1 =	The value configured in MR 1y08 of at least one analog input has fallen below the lower limit
Bit 20	**Collective bit "The upper limit has been exceeded"**	
	1 =	The value configured in MR 1y09 of at least one analog input has exceeded the upper limit
Bit 23	**Collective bit "Forcing is active"**	
	1 =	Forcing is active for at least one analog input
Bit 24	**Monitoring of internal voltages**	
	0 =	Monitoring has been deactivated
	1 =	Monitoring is active
Bit 30	**Synchronous data exchange**	
	1 =	Between the JX3-DMS2 module and the bus head, respectively the JetControl 3xx, there is synchronous data exchange

Module Register Properties	
Access	Read access
Value after reset	Depending on status and error messages of the module

MR 1y00

State of Analog Input y

Via MR 1y00, the module transmits the state report of analog input y.

Meaning of the Individual Bits		
Bit 1	**Validity of the read value**	
	0 =	In case of an error (e.g. at incorrect conversion)
	1 =	Readings are valid

Bit 3	Fastest possible conversion; oversampling in hardware on 64
Bit 4	Fast conversion; oversampling in hardware on 128
Bit 5	Slower conversion; oversampling in hardware on 256
Bit 6	Still slower conversion; oversampling in hardware on 512
Bit 8	**Forcing the channels** 0 = Measuring value of the channel is displayed 1 = Forcing value of the channel is displayed
Bit 9	Slowest possible conversion; oversampling in hardware on 1,024
Bit 12	Minimum of channel has been scaled
Bit 13	Maximum of channel has been scaled
Bit 14	**Channel is active** 0 = Channel is not active 1 = Channel is active

Module Register Properties	
Access	Read access
Value after reset	0x00000100

MR 1y01

Command

Via MR 1y01, various functions of the JX3-DMS2 module can be configured.

Commands	
6	Acknowledge collective bits.
160	Show scaled reading.
161	Show digitized value without scaling/conversion.
170	Show (again) the strain gage value (forcing is deactivated).
171	Show force value. Command 170 deactivates.
210	Capture the minimum value of the physical variable: Store ADC minimum value to MR 1y24.
220	Capture the maximum value of the physical variable: Store ADC maximum value to MR 1y26.

MR 1y04 **Force Value for Analog Input y**

At active forcing, the force value is written into module registers 2 or 3.

Module Register Properties	
Values	-32,768 ... 32,767 x factor 1,000
Value after reset	-50,000

MR 1y08 **Lower Limit of Analog Input y**

Module Register Properties	
Values	-32,768 ... 32,767 x factor 1,000
Value after reset	-50,000

MR 1y09 **Upper Limit of Analog Input y**

Module Register Properties	
Values	-32,768 ... 32,767 x factor 1,000
Value after reset	150,000

MR 1y20 **Trailing Indicator for Minimum Value of Analog Input y**

MR 1y20 contains the lowest digital value that has been output at analog input y so far.

Module Register Properties	
Values	-32,768 ... 32,767 x factor 1,000
Value after reset	+100,000

MR 1y21

Trailing Indicator for Maximum Value of Analog Input y

MR 1y21 contains the greatest digital value that has been output at analog input y so far.

Module Register Properties	
Values	-32,768 ... 32,767 x factor 1,000
Value after reset	-100,000

5.4.3 Oscilloscope

Introduction

The JX3-DMS2 module is equipped with an internal oscilloscope function. By means of the oscilloscope function, you can record values of various module registers.

JetSym

The JetSym programming software JetSym offers possibilities of easily operating the oscilloscope function and of graphically displaying the recorded values.

Technical Data

Parameter	Value
Recording interval	1 ms ... 65,535 ms
Number of channels	2 max.
Number of measuring values per channel	max. 150
Recordable module registers	MR 2: *Digital Value of Analog Input 1* MR 3: *Digital Value of Analog Input 2*
Module registers to which a trigger condition can be assigned	MR 2: *Digital Value of Analog Input 1* MR 3: *Digital Value of Analog Input 2*

Applications

The following applications are possible:

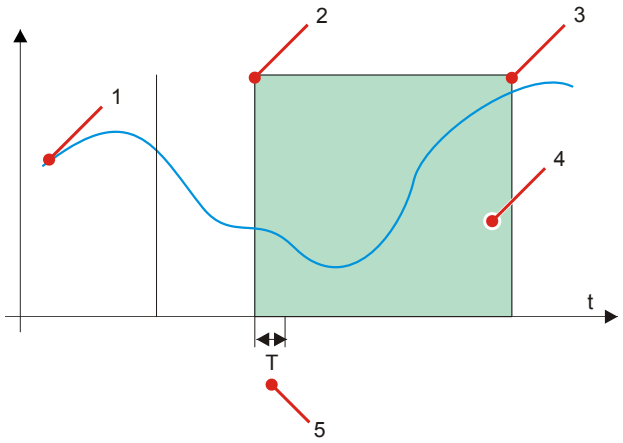
- Graphic evaluation of output values for documentation
- etc.

Contents

Start/Stop Recording

Start/Stop Recording

At Start/Stop recording, the JX3-DMS2 module is recording measuring values, until the maximum number of measuring values per channel has been recorded. Start/Stop recording is started by issuing command 1.



Number	Element
1	Values of the module register, out of which recordings are to be made.
2	Start of recording
3	End of recording
4	Recorded values
5	Recording interval

Configuration

Configuring the Start/Stop recording comprises the following steps:

Step	Action
1	Configure the module registers to be recorded. MR 9741 := 11 ... 14; MR 9742 := Module register number;
2	Configure the interval to be recorded. MR 9741 := 10; MR 9742 := Interval to be recorded;
3	Write value 1 into MR 9740 *Command for oscilloscope*.
⇨	**Result:** The JX3-DMS2 module starts recording. The JX3-DMS2 module keeps recording values, until the set number of values per channel has been recorded.

Step	Action
4	Check bit 0 of parameter *Index*. MR 9741 := 0;

If ...	... Then ...
Bit 0 = 0 in MR 9742	the module has terminated recording

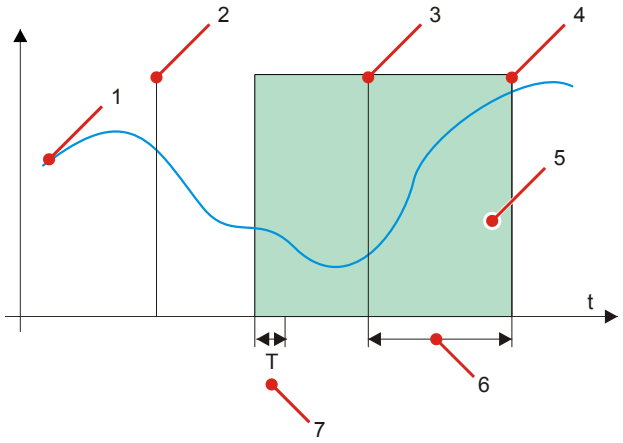
Related Topics

- **Register Description Oscilloscope** on page 97
- **Example: Recording and Reading of Values** on page 99

Continuous Recording

Continuous Recording

At continuous recording, the JX3-DMS2 module continually records measuring values. After issuing command 2 "Stop", the JX3-DMS2 module continues recording, until the post-buffer is filled with values. To start continuous recording, issue command 4.



Number	Element
1	Values of the module register, out of which recordings are to be made.
2	Start of continuous recording
3	Instance of "Stop" instruction
4	End of recording; the post-buffer is filled with values
5	Recorded values
6	Size of the post-buffer
7	Recording interval

Configuration

Configuration of continuous recording comprises the following steps:

Step	Action
1	Configure the module registers to be recorded. MR 9741 := 11 ... 14; MR 9742 := Module register number;
2	Configure the interval to be recorded. MR 9741 := 10; MR 9742 := Interval to be recorded;
3	Configure the size of the post-buffer. MR 9741 := 30; MR 9742 := Percentage of the max. number of measuring values per channel;

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Write value 4 into MR 9740 Command for Oscilloscope.
Result:
The JX3-DMS2 module starts recording.</td></tr>
<tr><td>5</td><td>Stop recording by writing value 2 into MR 9740 Command for Oscilloscope.</td></tr>
<tr><td>6</td><td>The JX3-DMS2 module further records values, until the post-buffer is filled.</td></tr>
<tr><td>7</td><td>Check bit 0 of parameter Index.
MR 9741 := 0;
<table><tr><th>If ...</th><th>... Then ...</th></tr><tr><td>Bit 0 = 0 in MR 9742</td><td>the module has terminated recording</td></tr></table></td></tr>
</table>

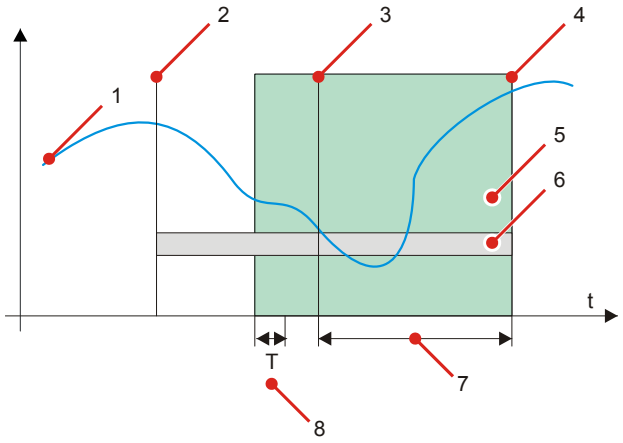
Related Topics

- **Register Description Oscilloscope** on page 97
- **Example: Recording and Reading of Values** on page 99

Recording Values under Trigger Condition

Recording Values under Trigger Condition

At recording values under trigger condition, the JX3-DMS2 module continually records measuring values. When the trigger condition has been met, recording is continued, until the post-buffer is filled with values. Recording under trigger condition is started by issuing command 3.



Number	Element
1	Values of the module register, out of which recordings are to be made
2	Start of recording with trigger condition
3	Trigger condition has been met
4	End of recording; the post-buffer is filled with values
5	Recorded Values
6	Value Range of the Trigger Condition
7	Size of the Post-Buffer
8	Recording Interval

Trigger Condition

The JX3-DMS2 module checks the trigger condition by the following rules:

- The value for trigger 1 in the module register has to be greater than a configured value.
- The value for trigger 2 in the module register has to be smaller than a configured value.
- There can be different module register numbers for trigger 1 respectively trigger 2.

$$MR[\text{Trigger1}] > VAL[\text{Trigger1}]$$
AND
$$MR[\text{Trigger2}] < VAL[\text{Trigger2}]$$

Element	Function
MR[Trigger1]	Value for trigger 1 in the module register
VAL[Trigger1]	Value for trigger 1
MR[Trigger2]	Value for trigger 2 in the module register
VAL[Trigger2]	Value for trigger 2

Configuration

To configure recording with trigger condition, take the following steps:

Step	Action
1	Configure the module registers to be recorded. MR 9741 := 11 ... 14; MR 9742 := Module Register Number;
2	Configure the interval to be recorded: MR 9741 := 10; MR 9742 := Interval to be Recorded;
3	Configure the size of the post-buffer: MR 9741 := 30; MR 9742 := Percentage of the Max. Number of Measuring Values per Channel;
4	Configure trigger 1: MR 9741 := 20; MR 9742 := Module Register Number for Trigger 1; MR 9741 := 21; MR 9742 := Value for Trigger 1;
5	Configure trigger 2: MR 9741 := 22; MR 9742 := Module Register Number for Trigger 2; MR 9741 := 23; MR 9742 := Value for Trigger 2;
6	Write value 3 into MR 9740 *Command for Oscilloscope*.
⇨	**Result:** The JX3-DMS2 module starts recording. The JX3-DMS2 module continually checks the trigger condition.

If ...	... Then ...
the trigger condition has been met	the JX3-DMS2 module further records values, until the post-buffer is filled.

Step	Action
7	Check bit 0 of parameter *State*. MR 9741 := 0; **If ... / ... Then ...** Bit 0 = 0 in MR 9742 → the module has completed the recording cycle.

Related Topics

- **Oscilloscope Register Description** on page 97
- **Example: Recording and Reading of Values** on page 99

Reading Out Recorded Values

Introduction

The module JX3-DMS2 stores recorded values in a volatile memory area.The recorded data get lost when the module is switched off. Also, if a new recording cycle is started, these values are overwritten.

Reading Out Recorded Values

To read out recorded values proceed as follows:

Step	Action
1	Check bit 0 of parameter *State*. MR 9741 := 0; **If ... / ... Then ...** Bit 0 = 0 in MR 9742 → the module has completed the recording cycle.
2	Enter the value 0 into MR 9743 *Index of Recorded Values*. MR 9743 := 0;
3	Each read access to MR 9744 *Recorded Values* reads out the next recorded value. **If ... / ... Then ...** you have read MR 9744 300 times → all recorded values of channel 1 have been read
4	Enter the value 300 into MR 9743 *Index of Recorded Values*. MR 9743 := 300;
5	Each read access to MR 9744 *Recorded Values* reads out the next recorded value. **If ... / ... Then ...** you have read MR 9744 300 times → all recorded values of channel 2 have been read

Oscilloscope Register Description

MR 9740

Command for Oscilloscope

The oscilloscope function on the JX3-DMS2 module can be controlled by this module register.

Commands	
1	**Starting a Recording Session** The JX3-DMS2 module starts recording immediately. Recording stops, when the memory for measuring values is full.
2	**Stopping a Recording Session** The JX3-DMS2 module stops recording immediately.
3	**Starting a Recording Session Once a Trigger Condition is Fulfilled** The JX3-DMS2 module starts monitoring the trigger condition. Once the trigger condition is fulfilled, the module starts recording. Recording stops, when the memory for measuring values is full.
4	**Starting Continuous Recording** The JX3-DMS2 module starts recording immediately. Recording is not stopped before issuing the *Stop recording* command.

MR 9741

Parameter Index for the Oscilloscope

Via the parameter index, the parameter in MR 9741 *Parameter Oscilloscope* is selected.

MR 9742

Parameters for Oscilloscope

Via these module registers, the oscilloscope function can be configured.

Index	Parameter
0	**State (read-only)** Bit 0: 1 = Recording is running Bit 1: 1 = Trigger active
10	**Recording interval** Value range: 1 ms ... 65,535 ms

11 ... 12	**Module register number for channel # 1 ... 2** Via parameters 11 through 12, the module registers to be recorded by the module are configured.
20	**Module register number for trigger # 1** Number of the module register for trigger condition # 1.
21	**Value for trigger # 1** Value in the module register for trigger condition # 1.
22	**Module register number for trigger # 2** Number of the module register for trigger condition # 2.
23	**Value for trigger # 2** Value in the module register for trigger condition # 2.
30	**Size of the post-buffer** Value range: 0 % ... 100 %

MR 9743

Index of the Recorded Values

Via this index, the recorded values are selected.

MR 9744

Recorded Values

Via this module register, the recorded values are read.

Example: Recording and Reading of Values

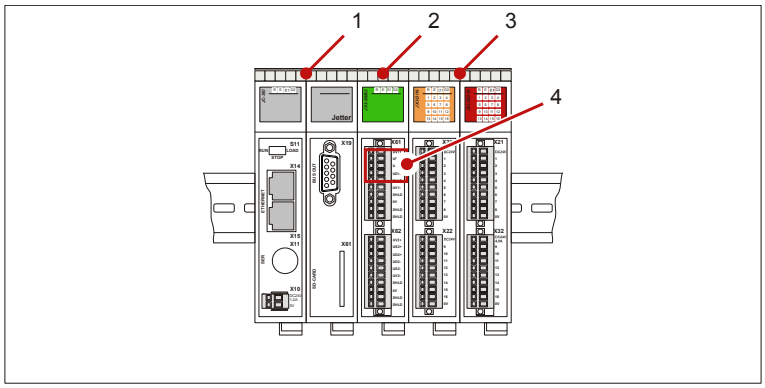
Task

The values at the analog inputs of a JX3-DMS2 module are to be recorded in intervals of 20 ms. After this, the values are stored to the registers of the controller.

Solution

The oscilloscope function of the JX3-DMS2 module records the values. After that, it reads the application program to the controller.

Sample Configuration



Number	Device	Function
1	JC-3xx	Controller
2	JX3-DMS2	Strain gage module: Module number 2
3 ... 4	JX3-xxx	Further JX3 modules

JetSym STX Program Variable Declaration

```
Type
    TYPE_JX3_DMS2_OSZI:
    Struct
        // Module registers of the oscilloscope function
        Command : Int At 4 * 9740;
        ParaIdx : Int At 4 * 9741;
        Para    : Int At 4 * 9742;
        DataIdx : Int At 4 * 9743;
        Data    : Int At 4 * 9744;
    End_Struct;
End_Type;

Var
    JX3_DMS2_02 : TYPE_JX3_DMS2_OSCI At %VL 100020000;
    // Control register for saving the values
    ValIdx      : Int;
    ValChannel1 : Array[150] Of Int;
    ValChannel2 : Array[150] Of Int;
    End_Var;
```

Configuration of the JetSym STX Program

```
Task main Autorun
    // Default: MR 2 ... MR 3 are recorded
    // Recording interval up to 20 ms
    JX3_DMS2_02.ParaIdx := 10;
    JX3_DMS2_02.Para := 20;
    // ...
```

Starting and Reading Out the JetSym STX Program

```
Task main Autorun
    // ...
    // Start recording
    JX3_DMS2_02.Command := 1;

    // Wait for recording to be ended
    JX3_DMS2_02.ParaIdx := 0;
    When
        BitClear(JX3_DMS2_02.Para, 0)
    Continue;

    // Set the index to 0
    JX3_DMS2_02.DataIdx := 0;
    // Read values of analog input 1
    FOR ValIdx := 0 To 74 Do
        ValChannel1[ValIdx] := JX3_DMS2_02.Data;
    End_For;

    // Set the index to 300
    JX3_DMS2_02.DataIdx := 150;
    // Read values of analog input 2
    FOR ValIdx := 0 To 74 Do
        ValChannel2[ValIdx] := JX3_DMS2_02.Data;
    End_For;
        // ...
```

5.5 Monitoring the State by Means of Collective Bits

Introduction

The module signals the status of both analog inputs by means of collective bits in MR 0 *Module State*.

Benefits

Monitoring the status of the analog outputs by means of collective bits offers the following benefits:

- In the application program, querying MR 0 is sufficient for acquiring the state of both analog outputs.

Statuses Signalled by means of Collective Bits

The following statuses are signalled by means of collective bits:

- The lower limit has been fallen below
- The upper limit has been exceeded
- The forcing function is active

Contents

Monitoring the State by Means of Collective Bits

Introduction

The module signals the state of both analog inputs by means of collective bits in MR 0 *Module State*. This allows to respond to a specific state of an individual analog input by just polling MR 0 from within the application program.

Overview of Registers

To diagnose the module and its analog inputs, the following module registers are used:

Registers	Description
MR 0	Module state
MR 1	Command
MR 1y00	State of analog input y (y = 1 or 2)

Collective Bits - Signalling

A collective bit in MR 0 *Module State* is set if at least one corresponding status bit in MR 1y00 *State of Analog Input y* is set.

Signalling by collective bits occurs as follows:

Step	Description
1	The module JX3-DMS2 signals the state of analog input y in MR 1y00 *State of Analog Input y*.

If ...	... Then ...
the lower limit has been fallen below	bit 19 in MR 1y00 is set
the upper limit has been exceeded	bit 20 in MR 1y00 is set
forcing has been activated	bit 23 in MR 1y00 is set

Step	Description
2	The module JX3-DMS2 signals the state of analog inputs y in MR 0 *Module State* via collective bits.

If at least on one analog input y ...	... Then ...
the lower limit has been fallen below	bit 19 in MR 0 is set
the upper limit has been exceeded	bit 20 in MR 0 is set
forcing has been activated	bit 23 in MR 0 is set

Acknowledging Collective Bits in the Application Program

In the application program collective bits are acknowledged as follows:

Step	Description
1	The application program detects a set collective bit in MR 0 *Module State*.
2	The application program checks if bits 19 through 23 in MR 1100 *State of Analog Input 1* are set. **If ...** / **... Then ...** one of the bits 19 through 23 is set / response and setting bits in MR 1100 to zero
3	The application program checks if bits 19 through 23 in MR 1200 *State of Analog Input 2* are set. **If ...** / **... Then ...** one of the bits 19 through 23 is set / response and setting bits in MR 1200 to zero
4	The application program deletes collective bits in MR 0 *Module State* by entering command 6 into MR 1 *Command*.

Related Topics

- **Description of Registers - Collective Bits** on page 104

Description of Registers - Collective Bits

MR 0

Module State

In MR 0 *Module State*, the module signalizes status and error messages of the module.

Meaning of the Individual Bits		
Bit 16	**Collective bit "Readings are valid"**	
	1 =	Both channels have got valid readings. The filter for a floating average per channel is filled.
Bit 19	**Collective bit "The lower limit has been fallen below"**	
	1 =	The value configured in MR 1y08 of at least one analog input has fallen below the lower limit
Bit 20	**Collective bit "The upper limit has been exceeded"**	
	1 =	The value configured in MR 1y09 of at least one analog input has exceeded the upper limit
Bit 23	**Collective bit "Forcing is active"**	
	1 =	Forcing is active for at least one analog input
Bit 24	**Monitoring of internal voltages**	
	0 =	Monitoring has been deactivated
	1 =	Monitoring is active
Bit 30	**Synchronous data exchange**	
	1 =	Between the JX3-DMS2 module and the bus head, respectively the JetControl 3xx, there is synchronous data exchange

Module Register Properties	
Access	Read access
Value after reset	Depending on status and error messages of the module

MR 1y01

Command

Via MR 1y01, various functions of the JX3-DMS2 module can be configured.

Commands	
6	Acknowledge collective bits.
160	Show scaled reading.
161	Show digitized value without scaling/conversion.
170	Show (again) the strain gage value (forcing is deactivated).
171	Show force value. Command 170 deactivates.
210	Capture the minimum value of the physical variable: Store ADC minimum value to MR 1y24.
220	Capture the maximum value of the physical variable: Store ADC maximum value to MR 1y26.

MR 1y00

State of Analog Input y

Via MR 1y00, the module transmits the state report of analog input y.

Meaning of the Individual Bits		
Bit 1	**Validity of the read value**	
	0 =	In case of an error (e.g. at incorrect conversion)
	1 =	Readings are valid
Bit 3	Fastest possible conversion; oversampling in hardware on 64	
Bit 4	Fast conversion; oversampling in hardware on 128	
Bit 5	Slower conversion; oversampling in hardware on 256	
Bit 6	Still slower conversion; oversampling in hardware on 512	
Bit 8	**Forcing the channels**	
	0 =	Measuring value of the channel is displayed
	1 =	Forcing value of the channel is displayed
Bit 9	Slowest possible conversion; oversampling in hardware on 1,024	
Bit 12	Minimum of channel has been scaled	
Bit 13	Maximum of channel has been scaled	
Bit 14	**Channel is active**	
	0 =	Channel is not active
	1 =	Channel is active

Module Register Properties	
Access	Read access
Value after reset	0x00000100

6 Locating of Errors

Purpose of this Chapter

This chapter is for supporting you when locating faults of the JX3-DMS2 module in the following fields of activity:

- Identifying the root cause of an error.
- Recognizing an error in the application program or in visualization
- Acknowledging an error message

Prerequisites

To be able to locate an error of the JX3-DMS2 module the following prerequisites have to be fulfilled:

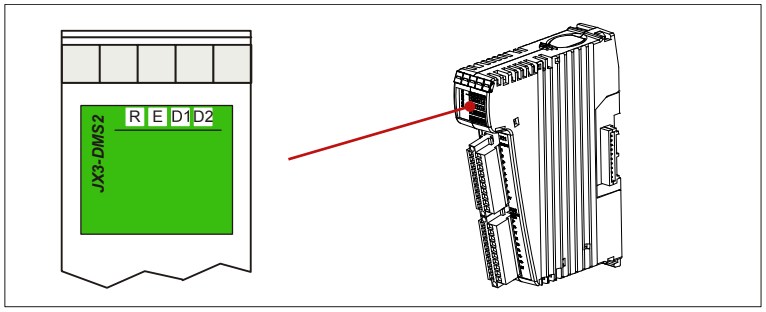
- The JX3-DMS2 module is connected to a JetControl device.
- The controller is linked with a PC.
- On the PC, the JetSym programming software has been installed.
- The minimum requirements regarding module, controllers and software have been met.

Contents

LEDs of the JX3-DMS2 Module

LEDs of the Module

The JX3-DMS2 module signalizes states and errors via LEDs. This feature facilitates spotting an error immediately.



LED	Color	Designation
R-LED	green	Run LED
E-LED	red	Error-LED
D1-LED	red	Diagnostics 1 LED
D2-LED	red	Diagnostics 2 LED

Normal Operating Condition

The LEDs of the JX3-DMS2 module have got the following states during normal operation:

R	E	D1	D2	Normal Operating Condition
ON	OFF	OFF	OFF	No error, communication is active

LEDs of the JX3-DMS2 Module

The JX3-DMS2 module is equipped with four LEDs to display states and errors.

R	E	D1	D2	State
ON	OFF	OFF	OFF	No error, communication is active
ON	-	-	ON	Short circuit / overload of channel 1 or channel 2

Diagnostics of Error Messages via Module Registers

Introduction

The module signals error messages in module register 0 *Module State*. Various error messages can be acknowledged by a command.

Overview of Registers

For diagnosing the module and the analog outputs, the following module registers are used:

Register	Description
MR 0	Module State
MR 1	Command #
MR 1y00	State of Analog Input y (y = 1 or 2)

Signalling an Error

The module JX3-DMS2 signals an error in the following way:

Stage	Description
1	The JX3-DMS2 module detects an error and sets the corresponding error bit in MR 0 *Module State*.
2	The JX3-DMS2 module activates the red D1 LED.
3	**Result:** Both the control system and the bus head respond to the error.

Response to Error Messages in the Application Program

The application program responds to an error message as follows:

Stage	Description
1	The application program detects in certain registers on the controller that module JX3-DMS2 signals an error.
2	Depending on the error bit in MR 0 *Module State* the application program responds to the error.
3	The user eliminates the cause of error.
4	In case of an irreversible fault, exchange the module. In any other error case, the fault can be reset by issuing command 6 in MR 1y01.
5	In case of an overcurrent, restart the module.
6	**Result:** ■ Error bits = 0 in MR 0 ■ LED D1 on the JX3 module goes off.
7	The application program acknowledges the error message in the controller and bus head.

Related Topics

- **Description of Registers: Evaluation of Errors** on page 113

Missing Connection to the Controller

Detecting the Error

The JX3-DMS2 module regularly checks the communication with the controller, respectively with the bus head.

Root Cause of Error

The following conditions can lead to this error:

- Voltage drop at the controller
- The lines connecting the module with the controller are broken
- Defective hardware of the bus head

Response of the Module to this Error

The module reacts to the error by passing through the following stages:

Stage	Description
1	Bit 30 Synchronous data exchange = 0 in MR 0 *Module State*
2	At the analog outputs, the configured error values are output.

Fixing the Root Cause

For fixing the root cause, proceed as follows:

Step	Action
1	Re-establish the connection to the controller
2	

If ...	... Then ...
the hardware of the bus head is defective,	send the bus head to Jetter AG for repair.

Resetting the Error

For fixing the root cause, proceed as follows:

Step	Action
1	

If ...	... Then ...
the bus head is a JX3-BN-CAN,	restart the system bus.

Related Topics

- **Register Description – Locating of Errors** on page 113

Invalid Operating System

Detecting the Error

After power-up, the JX3-DMS2 module checks, if there is a valid operating system.

Root Cause of the Error

The following conditions can lead to this error:

- Terminating an operating system update
- Hardware error of the JX3-DMS2 module

Response of the Module to this Error

The module reacts to the error by passing through the following stages:

Stage	Description
1	The module outputs 0 at the analog outputs.
2	The D2 LED is shortly flashing red.
3	The version number in MR 9 is 255.x.0.0 x: Version of the bootloader

Fixing the Root Cause

For fixing the root cause, proceed as follows:

Step	Action
1	Carry out an operating system update via JetSym.
2	

If ...	... Then ...
an operating system update cannot be carried out,	send the JX3-DMS2 module to Jetter AG for repair.

Resetting the Error

For resetting the fault, proceed as follows:

Step	Action
1	Restart the JX3 station.

Related Topics

- **Register Description – Locating of Errors** on page 113

Description of Registers: Evaluation of Errors

MR 0

Module State

In MR 0 *Module State*, the module signalizes status and error messages of the module.

Meaning of the Individual Bits		
Bit 16	**Collective bit "Readings are valid"**	
	1 =	Both channels have got valid readings. The filter for a floating average per channel is filled.
Bit 19	**Collective bit "The lower limit has been fallen below"**	
	1 =	The value configured in MR 1y08 of at least one analog input has fallen below the lower limit
Bit 20	**Collective bit "The upper limit has been exceeded"**	
	1 =	The value configured in MR 1y09 of at least one analog input has exceeded the upper limit
Bit 23	**Collective bit "Forcing is active"**	
	1 =	Forcing is active for at least one analog input
Bit 24	**Monitoring of internal voltages**	
	0 =	Monitoring has been deactivated
	1 =	Monitoring is active
Bit 30	**Synchronous data exchange**	
	1 =	Between the JX3-DMS2 module and the bus head, respectively the JetControl 3xx, there is synchronous data exchange

Module Register Properties	
Access	Read access
Value after reset	Depending on status and error messages of the module

MR 1y01

Command

Via MR 1y01, various functions of the JX3-DMS2 module can be configured.

Commands	
6	Acknowledge collective bits.
160	Show scaled reading.
161	Show digitized value without scaling/conversion.
170	Show (again) the strain gage value (forcing is deactivated).
171	Show force value. Command 170 deactivates.
210	Capture the minimum value of the physical variable: Store ADC minimum value to MR 1y24.
220	Capture the maximum value of the physical variable: Store ADC maximum value to MR 1y26.

MR 1y00

State of Analog Input y

Via MR 1y00, the module transmits the state report of analog input y.

Meaning of the Individual Bits		
Bit 1	**Validity of the read value**	
	0 =	In case of an error (e.g. at incorrect conversion)
	1 =	Readings are valid
Bit 3	Fastest possible conversion; oversampling in hardware on 64	
Bit 4	Fast conversion; oversampling in hardware on 128	
Bit 5	Slower conversion; oversampling in hardware on 256	
Bit 6	Still slower conversion; oversampling in hardware on 512	
Bit 8	**Forcing the channels**	
	0 =	Measuring value of the channel is displayed
	1 =	Forcing value of the channel is displayed
Bit 9	Slowest possible conversion; oversampling in hardware on 1,024	
Bit 12	Minimum of channel has been scaled	
Bit 13	Maximum of channel has been scaled	
Bit 14	**Channel is active**	
	0 =	Channel is not active
	1 =	Channel is active

Module Register Properties	
Access	Read access
Value after reset	0x00000100

7 Identification of the Module

Purpose of this Chapter

This chapter is to support identifying the JX3-DMS2 module in the following aspects:

- Identifying the module versions
- Reading the electronic data sheet EDS. A great number of production-relevant data are stored to the EDS.

Prerequisites

For identifying the JX3-DMS2 module, the following prerequisites have to be met:

- The JX3-DMS2 module has been connected to a JetControl.
- The controller is connected to a PC.
- On the PC, the programming software JetSym has been installed.
- The minimum requirements to modules, controllers and software have been met.

Information for our Hotline

In case you want to turn to the Jetter AG hotline to solve a technical problem, please keep the following information on the JX3-DMS2 module at hand:

- Version number in MR 9
- Hardware revision

Contents

Module Versions

Introduction

Every JX3 module contains software of unambiguous version numbers, which can be read out via module registers. You will need the version data, in case you want to turn to the Jetter AG hotline in order to solve a technical problem.

Version Number Format

The version numbers of the JX3-DMS2 modules are displayed by four sections of figures:

1	.	2	.	3	.	4

Element	Description
1	Major, respectively main version number
2	Minor, respectively sub-version number
3	Branch, respectively intermediate version number
4	Build version number

Overview of Registers

The version numbers can be read out of the following module registers:

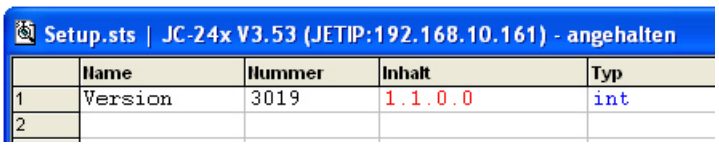
Register	Description
MR 9	Operating system version
MR 32	FPGA version
MR 257	Bootloader version

Released Version

When a version has been released, both branch and build version number is zero.

Version Numbers in the JetSym Setup

In order to display a version number, select the "IP Address" format in the JetSym Setup section.



Version Numbers in the Application Program

In order to display versions in the application program, please use the identifier IP#.

```
Task 0
    // Checking a version
    When
        JX3_Modul.Version = IP#1.1.0.0
    Continue;
    // ...
End_Task;
```

Related Topics

- **Register Description – Identification** on page 128

Electronic Data Sheet (EDS) with JC-3xx

Introduction

Numerous production-relevant data are permanently stored to the EDS. The EDS data can be read out from registers of the controller JC-3xx.

Overview of Registers

EDS data can be read out of the following registers:

Register(s)	Description
R 100500	Interface: 1 = Peripheral modules of the JX3 station
R 100501	Module number within the JX3 station
R 100600 ... R 100614	EDS Page 0 - Data
R 100700 ... R 100710	EDS Page 1 - Data

Contents of EDS Page 0

Production-related data can be read from EDS page 0. To be able to read out EDS page 0 register R 10041 must contain value 0.

Register(s)	Type	Description
R 100600	int	Revision of EDS page 0
R 100601	int	Module code
R 100602 ... R 100612	string	Module name
R 100613	int	Hardware revision
R 100614	int	Hardware revision

Contents of EDS Page 1

Production-related data can be read from EDS page 1. To be able to read out EDS page 1 special register 10041 must contain value 1.

Register(s)	Type	Description
R 100700	int	Revision of EDS page 1
R 100701 ... R 100707	string	Serial number
R 100708	int	Production date: day
R 100709	int	Production date: month
R 100710	int	Production date: year

Reading an EDS Page

To read an EDS page of a JX3-module connected to a JC-3xx proceed as follows:

Step	Action
1	Select the interface by entering 1 into R 100500.
2	Select the JX3-module by entering the module number into R 100501.
3	Read out EDS data from registers R 100600 ... 100710.

Related Topics

- **Example: Reading Out an EDS with JC-3xx**

Electronic Data Sheet (EDS) with JC-24x

Introduction

Numerous production-relevant data are permanently stored to the EDS. EDS data can be read via special registers. They are distributed among EDS page 0 and EDS page 1. Only one page at a time can be accessed via registers.

Overview of Registers

EDS data can be read out of the following registers:

Register(s)	Description
R 10040	I/O module number on the JX2 system bus
R 10041	EDS page
R 10041 ... R 10056	EDS Page 0 - Data
R 10041 ... R 10052	EDS Page 1 - Data

Contents of EDS Page 0

Production-related data can be read from EDS page 0. To be able to read out EDS page 0 register R 10041 must contain value 0.

Register(s)	Type	Description
R 10042	int	Revision of EDS page 0
R 10043	int	Module code
R 10044 ... R 10054	string	Module name
R 10055	int	Hardware revision
R 10056	int	Hardware revision

Contents of EDS Page 1

Production-related data can be read from EDS page 1. To be able to read out EDS page 1 special register 10041 must contain value 1.

Register(s)	Type	Description
R 10042	int	Revision of EDS page 1
R 10043 ... R 10049	string	Serial number
R 10050	int	Production date: day
R 10051	int	Production date: month
R 10052	int	Production date: year

Reading an EDS Page

To read an EDS page of a JX3-module connected to a JC-24x proceed as follows:

Step	Action
1	Select the JX3 module by entering the I/O module number into R 10040.
2	Select the EDS page by entering the page number into R 10041.
3	Read out EDS data from registers R 10042 ... 10056.

Related Topics

- **Example: Reading Out an EDS with JC-24x** on page 126

Electronic Data Sheet (EDS) with JC-647 and JX6-SB(-I)

Introduction

Numerous production-relevant data are permanently stored to the EDS. EDS data can be read via special registers. They are distributed among EDS page 0 and EDS page 1. Only one page at a time can be accessed via registers.

Overview of Registers

The register numbers for reading the EDS are dependent on the submodule socket number *m* where the JX6-SB(-I) is located:

Register(s)	Description
R 3m10040	I/O module number on the JX2 system bus
R 3m10041	EDS page
R 3m10041 ... R 3m10056	EDS Page 0 - Data
R 3m10041 ... R 3m10052	EDS Page 1 - Data

Contents of EDS Page 0

Production-related data can be read from EDS page 0. To be able to read out EDS page 0 register R 3m10041 must contain value 0.

Register(s)	Type	Description
R 3m10042	int	Revision of EDS page 0
R 3m10043	int	Module code
R 3m10044 ... R 3m10054	string	Module name
R 3m10055	int	Hardware revision
R 3m10056	int	Hardware revision

Contents of EDS Page 1

Production-related data can be read from EDS page 1. To be able to read out EDS page 1 register R 3m10041 must contain value 1.

Register(s)	Type	Description
R 3m10042	int	Revision of EDS page 1
R 3m10043 ... R 3m10049	string	Serial number
R 3m10050	int	Production date: day
R 3m10051	int	Production date: month
R 3m10052	int	Production date: year

Reading an EDS Page

To read out an EDS page proceed as follows:

Step	Action
1	Select the JX3 module by entering the I/O module number into R 3m10040.
2	Select the EDS page by entering the page number into R 3m10041.
3	Read out EDS data from registers R 3m10042 ... 3m10056.

Example: Reading Out an EDS with JC-3xx

Task

In the JetSym setup window EDS data of any JX3 module is to be displayed.

Solution

In a JetSym application program the EDS registers are declared as variables. The variables are then entered into the setup pane.

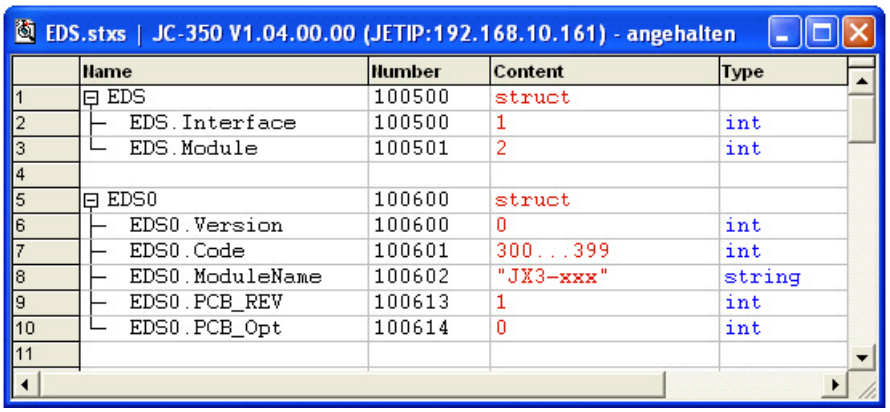
Sample Configuration

A JX3-xxx module is connected to a JC-3xx controller. The module JX3-xxx is part of a JX3 station and its module number is 2.

JetSym STX Program

```
Type
    // Defining interface and module number
    JX3_EDS:
    Struct
        Interface : Int;
        Module    : Int;
    End_Struct;

    // Defining EDS page 0
    JX3_EDS_PAGE0:
    Struct
        Version    : Int;
        Code       : Int;
        ModuleName : String[31];
        PCB_REV    : Int;
        PCB_Opt    : Int;
    End_Struct;

    // Defining EDS page 1
    JX3_EDS_PAGE1:
    Struct
        Version    : Int;
        Sernum     : String[19];
        TS_Day     : Int;
        TS_Month   : Int;
        TS_Year    : Int;
    End_Struct;
End_Type;

Var
    EDS  : JX3_EDS At %VL 100500;
    EDS0 : JX3_EDS_PAGE0 At %VL 100600;
    EDS1 : JX3_EDS_PAGE1 At %VL 100700;
End_Var;
```

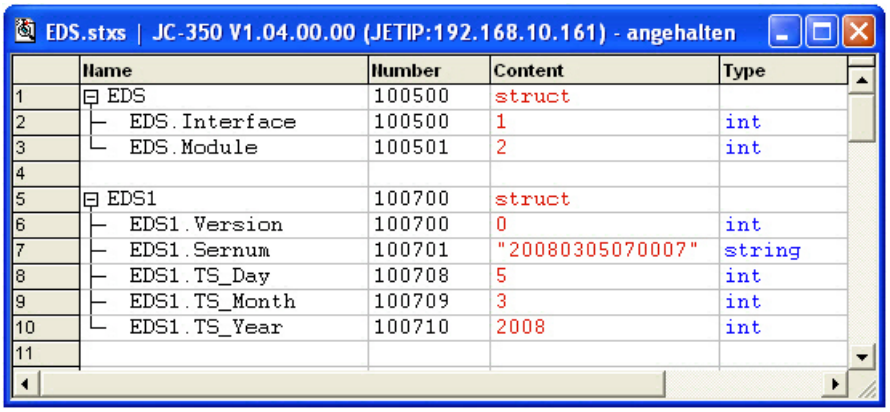
Reading EDS Page 0



	Name	Number	Content	Type
1	EDS	100500	struct	
2	EDS.Interface	100500	1	int
3	EDS.Module	100501	2	int
4				
5	EDS0	100600	struct	
6	EDS0.Version	100600	0	int
7	EDS0.Code	100601	300...399	int
8	EDS0.ModuleName	100602	"JX3-xxx"	string
9	EDS0.PCB_REV	100613	1	int
10	EDS0.PCB_Opt	100614	0	int
11				

Element	Description
EDS.Interface	1 = EDS data of the modules within the JX3 station
EDS.Module	2 = Module number

Reading EDS Page 1



	Name	Number	Content	Type
1	EDS	100500	struct	
2	EDS.Interface	100500	1	int
3	EDS.Module	100501	2	int
4				
5	EDS1	100700	struct	
6	EDS1.Version	100700	0	int
7	EDS1.Sernum	100701	"20080305070007"	string
8	EDS1.TS_Day	100708	5	int
9	EDS1.TS_Month	100709	3	int
10	EDS1.TS_Year	100710	2008	int
11				

Element	Description
EDS.Interface	1 = EDS data of the modules within the JX3 station
EDS.Module	2 = Module number

Example: Reading Out an EDS with JC-24x

Task

In the JetSym setup window EDS data of any JX3 module is to be displayed.

Solution

In a JetSym application program the EDS registers are declared as variables. The variables are then entered into the setup window.

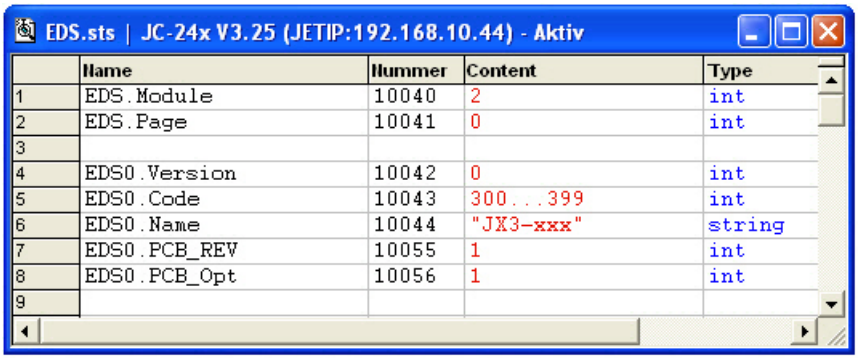
Sample Configuration

A JX3-BN-CAN with a JX3-xxx module is connected to a JC-24x controller. The module JX3-xxx has got I/O module number 2 on the JX2 system bus.

JetSym ST Program

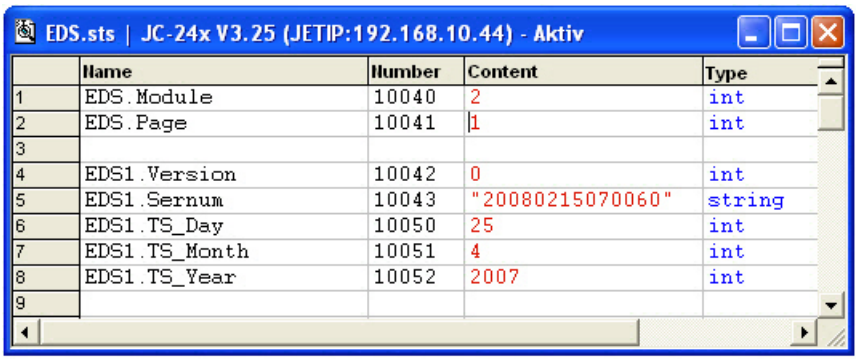
```
Type
    // Defining module number and EDS page
    JX3_EDS:
    Struct
        Module   : Int;
        Page     : Int;
    End_Struct;

    // Defining EDS page 0
    JX3_EDS_PAGE0:
    Struct
        Version  : Int;
        Code     : Int;
        Name     : String[31];
        PCB_REV  : Int;
        PCB_Opt  : int;
    End_Struct;

    // Defining EDS page 1
    JX3_EDS_PAGE1:
    Struct
        Version  : Int;
        Sernum   : String[19];
        TS_Day   : Int;
        TS_Month : Int;
        TS_Year  : Int;
    End_Struct;
End_Type;

Var
    EDS  : JX3_EDS At %VL 10040;
    EDS0 : JX3_EDS_PAGE0 At %VL 10042;
    EDS1 : JX3_EDS_PAGE1 At %VL 10042;
End_Var;
```

Reading EDS Page 0



Element	Description
EDS.Module	2 = Module number
EDS.Page	0 = Data of EDS page 0

Reading EDS Page 1



Element	Description
EDS.Module	2 = Module number
EDS.Page	1 = Data of EDS page 1

Register Description - Identification

MR 9

Operating System Version

In MR 9, the operating system version of the JX3-DMS2 module is displayed. Via JetSym, another operating system can be transmitted to the JX3-DMS2 module.

Module Register Properties	
Values	Released operating system version: IP#1.0.0.0 ... IP#254.255.0.0
	Bootloader version: IP#255.1.0.0 ... IP#255.255.0.0
Access	Read
Value following a reset	Operating system version

MR 32

FPGA Version

In MR 32, the FPGA version of the JX3-DMS2 module is displayed. A modification of the FPGA version cannot be carried out by the user.

Module Register Properties	
Values	IP#1.0.0.0 ... IP#255.255.0.0
Access	Read
Value following a reset	FPGA version

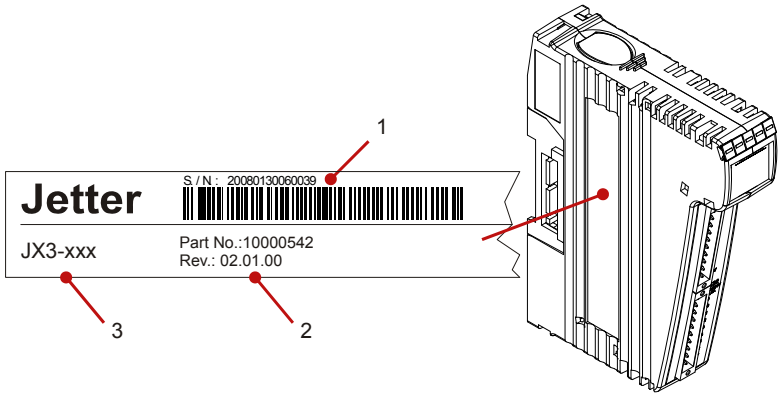
Identification via Nameplate

Introduction

Each JX3 module can be identified by its nameplate attached to its enclosure. You will need the hardware revision data if you have to contact the hotline of Jetter AG in case of a problem.

Nameplate

The nameplate of JX3 modules contains the following information:



Number	Element
1	Serial number
2	Hardware revision
3	Module name

8 Quick Reference - JX3-DMS2

Operating System Version

This quick reference summarizes the registers of the straingage module JX3-DMS2 with OS version 1.03.0.00.

General Register Overview

0	Module state
2 ... 3	Analog inputs 1 through 2
9, 32, 257	Versions
1100 ... 1199	Configuration of analog input 1
1200 ... 1299	Configuration of analog input 2
9740 ... 9744	Oscilloscope

Register Numbers

JC-3xx	100mmzzzz	
	mm	Module number: 02 ... 17
	zzzz	Module register number: 0000 ... 9999
JC-24x	3xxz	
	xx	I/O module number - 2: 00 … 30
	z	Module register number: 0 ... 9
	Only indirect access to further module registers	
JC-647	3m03xxz	
	m	Submodule socket: 1 ... 3
	xx	I/O module number - 2: 00 ... 30
	z:	Module register number: 0 ... 9
	Only indirect access to further module registers	

Meaning of y

y	Number of analog input y = 1 ... 2

Module State

0	**Module state**
Bit 16 = 1:	Collective bit "Readings are valid"
Bit 19 = 1:	Collective bit "Lower limit"
Bit 20 = 1:	Collective bit "Upper limit"
Bit 23 = 1:	Collective bit "Forcing"
Bit 24 = 1:	Monitoring - voltages
Bit 30 = 1:	Synchronous data exchange

Readings - Channel 1 and Channel 2

2	Digital value for analog input # 1
3	Digital value for analog input # 2

Versions

9	OS version
32	FPGA version
257	Bootloader version

State of Analog Input y

1y00	**State of analog input y (y = 1 ... 2)**
Bit 1 = 1:	Readings are valid
Bit 3 = 1:	Fastest possible conversion
Bit 4 = 1:	Fast conversion
Bit 5 = 1:	Slower conversion
Bit 6 = 1:	Still slower conversion
Bit 8 = 1:	Forcing value is displayed
Bit 9 = 1:	Slowest possible conversion
Bit 12 = 1:	Minimum of channel y has been scaled
Bit 13 = 1:	Maximum of channel y has been scaled
Bit 14 = 1:	Channel y is active

Commands for Analog Input y

1y01	**Commands for analog input y (y = 1 ... 2)**
6	Acknowledgement of collective bits
160	Show scaled reading
161	Show digitized value without scaling/conversion
170	Show (again) the strain gage value. (Forcing OFF)
171	Show force value
210	Capture the minimum value of the physical variable: Store ADC minimum value to MR 1y24.
220	Capture the maximum value of the physical variable: Store ADC maximum value to MR 1y26.

User-Scaling

1y06	Number of averaging cycles: 1, 2, 4, 8, 16, 32, 64, 128
1y11	Sensor sensitivity in µV/V
1y24	1st digital value for analog input y
1y25	1st value of the physical variable (minimum)
1y26	2nd digital value for analog input y
1y27	2nd value of the physical variable (maximum)
1y28	Offset t of straight line y = mx +t
1y29	Offset of actual value (similar to tare function with scales)

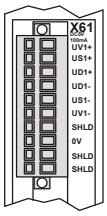
Other Configurations

1y04	Force value for analog input y
1y08	Lower limit of analog input y
1y09	Upper limit of analog input y
1y20	Trailing indicator for minimum value of analog input y
1y21	Trailing indicator for maximum value of analog input y

Oscilloscope

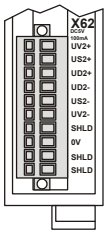
9740	Instruction
9741	Parameter index
9742	Parameter
9743	Data index
9744	Data

Assignment of Terminal X61



Terminal point	**Signals of resisitive sensor 1**
X61.UV1+	Power supply (+) for sensor (+5 V/100 mA)
X61.US1+	Do not connect
X61.UD1+	Sensor: Signal+
X61.UD1-	Sensor: Signal-
X61.US1-	Do not connect
X61.UV1-	Power supply (-) for sensor
X61.SHLD	Shielding connection
X61.0V	Reference potential
X61.SHLD	Shielding connection
X61.SHLD	Shielding connection

Assignment of Terminal X62



Terminal point	**Signals of resisitive sensor 2**
X62.UV2+	Power supply (+) for sensor (+5 V/100 mA)
X62.US2+	Do not connect
X62.UD2+	Sensor: Signal+
X62.UD2-	Sensor: Signal-
X62.US2-	Do not connect
X62.UV2-	Power supply (-) for sensor
X62.SHLD	Shielding connection
X62.0V	Reference potential
X62.SHLD	Shielding connection
X62.SHLD	Shielding connection

Appendix

Introduction

This appendix contains electrical and mechanical data, as well as operating data.

Contents

A: Technical Data

Introduction

This section of the appendix contains both electrical and mechanical data, as well as operating data of the JX3-DMS2 module.

Contents

Technical Data

Electrical Data

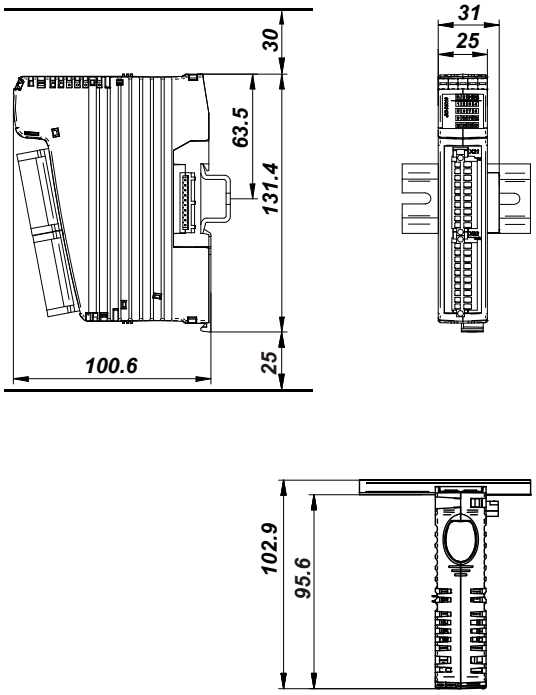
Parameter	Value
For each channel, there is an amplifier that can be freely set (reciprocal of the strain gage sensitivity value)	0.5- to 1,050-fold
Output voltage, short-circuit-proof	4.89 V +/-0.3 V per channel
Maximum current per channel	100 mA (operation) at 108 mA +/- 6 mA triggers the electronic overcurrent protection.
Sensitivity of the Sensor	1 mV/V through 400 mV/V max.

Technical Data - JX3 System Bus

Parameter	Value
Logic voltage of the JX3 system bus	DC +5 V (-15 %... +10 %)
Current consumption absorbed from the logic voltage of the JX3 system bus	Typically I_{5V}: 65 mA
Additional voltage of the JX3 system bus	DC +24 V (-15 %... +20 %)
Current consumption absorbed from the additional voltage of the JX3 system bus	Typically I_{24V}: 65 mA
Nominal power absorbed from the JX3 system bus	Typically: 1.9 W

Physical Dimensions

Physical Dimensions



Minimum Clearances

At mounting the JX3-DMS2 module, make sure to maintain a minimum clearance above and below. At replacing the module, you can operate the locking mechanisms of the JX3 backplane module using your fingers.

- Minimum clearance above: 30 mm
- Minimum clearance below: 25 mm

Module Width

The JX3-DMS2 module requires a space of 31 mm width. At connecting the JX3-DMS2 module to a JX3 station, the width is increased by 25 mm.

Mounting Position

The mounting position of the JX3-DMS2 module is vertical.

Operating Parameters: Environment and Mechanics

Environment

Parameter	Value	Standard
Operating temperature range	0 ... +50 °C	
Storage temperature range	-40 ... +70 °C	DIN EN 61131-2 DIN EN 60068-2-1 DIN EN 60068-2-2
Air humidity	10 ... 95 %, non-condensing	DIN EN 61131-2
Pollution degree	2	DIN EN 61131-2
Corrosion / Chemical resistance	No special protection against corrosion. Ambient air must be free from higher concentrations of acids, alkaline solutions, corrosive agents, salts, metal vapors, or other corrosive or electroconductive contaminants	
Max. operating altitude	2,000 m above sea level	DIN EN 61131-2

Mechanical Parameters

Parameter	Value	Standard
Free falls withstanding test	Free fall at Shipping packaging: 1 m Product packaging: 0.3 m	DIN EN 61131-2 DIN EN 60068-2-32
Vibration resistance	5 Hz - 9 Hz: 3.5 mm amplitude 9 Hz - 150 Hz : 1 g acceleration: 1 octave/minute, 10 frequency sweeps (sinusoidal), all 3 spatial axes	DIN EN 61131-2 DIN EN 60068-2-6
Shock resistance	15 g occasionally, 11 ms, sinusoidal half-wave, 3 shocks in the directions of all three spatial axes	DIN EN 61131-2 DIN EN 60068-2-27
Degree of protection	IP20	DIN EN 60529
Mounting position	Vertical position, snapped on DIN rail	

Operating Parameters: Enclosure

Electrical Safety

Parameter	Value	Standard
Protection class	III	DIN EN 61131-2
Dielectric test voltage	Functional ground is connected to chassis ground internally.	DIN EN 61131-2
Protective connection	0	DIN EN 61131-2
Overvoltage category	II	DIN EN 61131-2

EMC - Emitted Interference

Parameter	Value	Standard
Enclosure	Frequency band 30 - 230 MHz, limit 30 dB (µV/m) in 10 m Frequency band 230 - 1,000 MHz, limit 37 dB (µV/m) in 10 m (class B)	DIN EN 61000-6-3 DIN EN 61000-6-4 DIN EN 55011

EMC - Immunity to Interference

Parameter	Value	Standard
Magnetic field with mains frequency	50 Hz 30 A/m	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-8
RF field, amplitude-modulated	Frequency band 80 MHz - 2 GHz Test field strength: 10 V/m AM 80 % at 1 kHz Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-3
ESD	Discharge through air: Test peak voltage 8 kV Contact discharge: Test peak voltage 4 kV Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-2

DC Power Supply Inputs and Outputs

EMC - Emitted Interference

Parameter	Value	Standard
Signal and control interface DC power supply inputs and outputs	Frequency bands: 0.15 to 0.5 MHz, limit 40 to 30 dB 0.5 to 30 MHz, limit 30 dB (class B)	DIN EN 61000-6-3

EMC - Immunity to Interference

Parameter	Value	Standard
RF, asymmetric	Frequency band 0.15 – 80 MHz Test voltage 3 V AM 80 % at 1 kHz Source impedance 150 Ohm Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-6
Bursts	Test voltage 2 kV tr/tn 5/50 ns Repetition frequency 5 kHz Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-4
Voltage surges asymmetric (line to earth) symmetrical (line to line)	tr/th 1.2/50 µs Common-mode interference voltage 1 kV Series-mode interference voltage 0.5 kV	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-5

Shielded Data and I/O Lines

EMC - Immunity to Interference

Parameter	Value	Standard
Asymmetric RF, amplitude-modulated	Frequency band 0.15 – 80 MHz Test voltage 3 V AM 80 % at 1 kHz Source impedance 150 Ohm Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-6
Bursts	Test voltage 1 kV tr/tn 5/50 ns Repetition frequency 5 kHz Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-4
Voltage surges, asymmetric (line to earth)	tr/th 1.2/50 µs Common-mode interference voltage 1 kV	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-5

EMC - Interference Immunity of Functional Earth Connections

Parameter	Value	Standard
RF, asymmetric	Frequency band 0.15 – 80 MHz Test voltage 3 V AM 80 % at 1 kHz Source impedance 150 Ohm Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-6
Bursts	Test voltage 1 kV tr/tn 5/50 ns Repetition frequency 5 kHz Criterion A	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-4

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