PMA Prozeß- und Maschinen-Automation GmbH



# Modular Controller System KS vario



BlueControl <sup>®</sup> is a registered trademark of PMA Prozeß- und Maschinen-Automation GmbH

© PMA Prozeß- und Maschinen-Automation GmbH -Printed in Germany All rights reserved. No part of this document may be reproduced or published in any form or by any means without prior written permission from the copyright owner.

> A publication of PMA Prozeß- und Maschinen Automation Postfach 310229 D-34058 Kassel Germany

# Content

1.	Genera	I
2.	Hints fo	or operation
	2.1.	Connecting the interface, signification of indicator LEDs on the bus coupler 6
	2.2.	Forcing
	2.3.	Fail-safe
3.	Commu	<b>nication via DeviceNet</b>
	3.1.	Definition of transmitted data in the "BlueControl" engineering tool. 9
	3.3.	Structure of the data cache in KS vario
	3.4.	Example
	3.5.	Communication with the PLC at the example of Rockwell with RSNetWorx 13
		3.5.1 EDS installation and network configuration with RSNetWorx 13
		3.5.2 Example: DeviceNet communication procedure (PLC <> KS vario) 19
	3.6.	Parameter access to KS vario data in RSNetWorx
4.	KS vari	o DeviceNet "Object directory"

# **1.** General

Modular controller system KS vario permits connection of various fieldbus interfaces. For this purpose, the relevant bus coupler is used as a head station for a controller system.

Via one of these bus couplers, the DeviceNet protocol is supported by means of a front-panel interface (9-pole Sub-D connector). Hereby, transmission of all process, parameter and configuration data is possible. This communication interface permits communication with supervisory systems, visualization tools, etc. Another standard interface is provided on the KS vario controller modules. This full RS232 interface is used for connection of the 'BlueControl' tool, which runs on a PC.

**CAN Physical** Layer There are various standards related to the CAN Physical Layer. The most important standard for general applications is the "CAN High-Speed Standard ISO 11898-2". The recommendations given below are based primarily on this standard and are valid independent of the used CAN protocol (CANopen / DeviceNet).

*ISO 118982* A node compliant with ISO 11898-2 comprises a microcontroller with CAN controller (which may or may not be integrated), which is connected with a CAN transceiver via Rx and Tx line. The transceiver is connected to the differential CAN-H and CAN-L lines at the CAN bus. With KS vario, this (transceiver) connection is galvanically isolated.



With CAN bus, the nominal CAN bus levels are described as "Recessive" (nominal voltage 2,5V for CAN-H and CAN-L) and "Dominant" (nominal 3,5V for CAN-H and 1,5V for CAN-L).



# *Baudrates, bus lengths* The maximum useful bus length in a CAN network is determined by a variety of effects, in particular, the following physical effects:

- The delay time of the connected bus nodes (with/without opto-couplers) and the delay time of the bus cable (propagation delays)
- various scanning times within a CAN bit cell due to the oscillator tolerances of bus nodes,

• signal amplitude attenuation due to the resistance of the bus cable and the input resistances of bus nodes When using ISO 11898-2-compliant transceivers, the bus lengths mentioned below can be realized with standard bus cables.

Selectable Baudrates

Baudrate	Bus length	Nominal bit time
500 kBd	100m	2 μs
250 KBd	200m	4 μs
125 KBd	500 m	8 μs

For further information on bus lengths, see also standards CiA []DS-102] (CANopen) or ODVA "DeviceNet Specifications Volume I, Release 2.0", in particular, Appendix A and B.

**Cable parameters** ISO 11898-2 defines some DC or AC parameters for the cables which can be used in CAN bus networks (typically, pairwisely twisted cables with defined electrical properties are used). The important AC parameters are 120 Ohm cable impedance and a nominal "propagation delay" of 5 ns/m ! Recommendations for the bus cables and terminating resistors are given in the following table:

Bus length	Bus cable (Z: 120 O	hm, tp: 5ns/m)	Terminating resistor	Max. bit rate
	Spec. resistance	Cable cross section		
0 40 m	70 mOhm/m	0,25mm", 0,34mm"	124 Ohm, 1%	1 MBd
		AWG 23, AWG 22		@ 40m
40 m 300 m	<60 m0hm/m	0,34mm <sup>°°</sup> , 0,6mm <sup>°°</sup>	127 Ohm, 1% <sup>*</sup> )	> 500 kBd
		AWG 22, AWG 20		@ 40m
300 m 600 m	<40 m0hm/m	0,5mm <sup></sup> , 0,6mm <sup></sup>	127 Ohm, 1% <sup>*</sup> )	> 100 kBd
		AWG 20		@ 40m
600 m 1 km	<26 m0hm/m	0,75mm", 0,8mm"	127 Ohm, 1% *)	> 50 kBd
		AWG 18		@ 40m

\*) With very long cables, a higher value for the terminating resistor (150 .. 300 Ohm) is useful for reducing the attenuation.

Further recommendations for CAN networks (especially large ones):

- Galvanic isolation is necessary with very long cables (e.g. 400m bus cable)
- A separate ground line is purposeful.
- The voltage drop (potential difference) across the transceiver ground potentials should be low (smaller than 2 V). Supply voltage from power supply in the middle of the cable.
- The total input resistance of bus nodes should be > 500 Ohm.
- Any tap lines should be as short as possible to prevent/reduce reflections, e.g.<6m @ 500kBd (DeviceNet), and <1 m with higher Baudrates !

For further information, refer to ODVA (DeviceNet), CiA (CANopen), various chip manufacturers and Internet.

# 2.

# Hints for operation

# **2.1.** Connecting the interface, signification of indicator LEDs on the bus coupler

An EDS (Electronic Data Sheet) file is required for KS vario operation. Download is possible from: http://www.pma-online.de/ (see Software -> EDS files for KS vario).

*Pin allocation* Connection is via a 9-pole Sub-D connector. *Sub-D* 

Pin	Sig nal
1	unused
2	CAN-L
3	CAN ground
4	unused
5	unused
6	CAN ground
7	CAN-H
8	unused

6

7

8

9



Fig.: Bus coupler

#### LEDs

LED no.	LED colour	Function
US	green	24 V segment voltage provided
UM	green	24V main supply provided (presently not used)
UB	green	24V coupler voltage provided
D1	red	TxD: blinks like data flow "send"
D2	redot	RxD: blinks like data flow "receive"

*Address, Baudrate* Address and Baudrate have to be configured via the "BlueControl" tool. For operation of the tool, an interface cable must be connected to the local RS232 interface of KS vario.

6

#### 2.2. Forcing All physical inputs can be overwritten (configurable) via DeviceNet. Thus e.g. process value measurement via remote Inputs I/O (e.g. VARIO I/O system) and entry via the bus are possible. With output forcing, the fail-safe function setting must be taken into account. If "zero" fail-safe behaviour is selected, **Outputs** all outputs are set to zero in case of bus error or master stop, otherwise, their old value remains unchanged. 2.3. Fail-safe User parameter setting 'fail-safe' determines the instrument behaviour in case of master bus failure or 'bus stop'. Bus failure

Fail-safe	Reaction in case of bus failure or master stop
Last value	Continue operation with the values sent last.
	Forced analog inputs are set to FAIL.
zero	Forced analog inputs are set to FAIL 1).
	Forced digital inputs are set to zero .
	Forced outputs are set to zero.

In case of bus failure, the instrument operates according to the following rules.

7

# **3.** Communication via DeviceNet

KS vario supports data "polling" and the access via "explicit message".

The data which should be transferred by polling can be selected easily and freely via the "BlueControl" engineering tool. After selection, the engineering can be downloaded into the non-volatile flash memory of KS vario.

#### **3.1.** Basic settings for DeviceNet communication in the "BlueControl" engineering tool

Address selection Select "DeviceNet" bus interface in the window for instrument selection (possible from operating version 3).

räteauswahl		
		OK
Grundgerät	KS vario	
Bedienversion	3	Abbrechen
Bestellnummer	KSVC-104-10441-000	
Eingangsvariante	T8/UTH (8 Eing., Thermo)	Hilfe
Bus-Schnittstelle	DeviceNet	

#### Adjusting address and Baudrate

Adjust the node address (MAC-Id) and the Baudrate in "Parameter setting" :



The bus data (read/write) which should be transmitted can be composed by selecting them as required. An example for channel-specific data selection is given in the following chapter:

### **3.2.** Definition of transmitted data in the "BlueControl" engineering tool

With a Rockwell PLC, max. 127 read data or 127 write data can be transmitted. Data transmission is as word data with 16 bits in Fix-Point1 format, i.e. with one digit behind the decimal point. Although a higher amount of data can be selected in the BlueControl tool (max. 1080), all data exceeding a maximum number of 127 are not taken into account (shown with red background) and truncated.

Polling

Selection of any process data and parameters for polling is possible using the BlueControl tool in KS vario. These data are updated continuously in the KS vario cache memory and can be read or written via "polling" by the PLC. The process data comprise a data range of 1080 (DeviceNet: 127) word data both in the write cache and in the read cache.

In BlueControl, the data which should be read can be selected using 2 methods (write direction accordingly):

Max. 120 parameters and process data of any channels for writing and max. 120 for reading. The position determines the order of transmission.

Bus data (read) - koffer.bct						_0	×
🍢 📲 🎭 🚰 📳 Bus data (read)		•					
Channel 1	Name	э	Description		Image: Constraint of the second sec		
KS vario	Image: Second						
Parameter	Image: Image						
🗄 🧰 System	Ynid	1	■ Exclusion         Controller            orticoler status          actuality variable          iffective setupoin         control devision         namual actuality value          actuality value				
Ine conductor 1	XEff		effective process value				
Ine conductor 2	SP.E	F	effective setpoint				
🚰 line conductor 3	diFF		control deviation				
	Ymar	1	manual actuating value				
Bar External TC	DYm	an	actuator value (delta)				
External IC	Yinc		actuating value increase				
Bet Controller	YDec	-	actuating value decrease	- dama and			
Parameter set 2	T Ch-	a .	The parameters of the controller have	e changed			
P* Input	Tut	1	delau time beating				
🚰 Setpoint	Vmax	đ	maximum rate of change heating				
- 🔐 Limit	Kp1		process gain heating				
🖻 🧰 Signals	Msg1		result of selftuning heating				
🖃 🧰 System	Tu2		delay time cooling		Channel         Offset		
- gr Digital Input	Vmay	Controll     Control d     n manual a     cacuading     c accuading     c accuading     c accuading     c accuading     The para     a status se     control d     delay tim     v2 maximum     process     to accuading     C maximum     Process     Control d     control d	maximum rate of change cooling				Ľ
English State digital	*省	$\times \pm$	÷				
- B** State analog	No	Name	Description	Channel	Offeet		
- P* Heating current	1	XEff	effective process value	1	Diffeet         Image: Control of the control of		-
- 🗗 Forcing digital	2	Ypid	actuating variable	1	1		
🚽 Forcing analog	3	Pb1	proportional band 1 [phys]	1	2		
🖨 🧰 Device	4	ti1	integral action 1 [s]	1	3		
P* Device	5	td1	derivative action 1 [s]	1	4		
Alarm	6	X.Eff	effective process value	2	5		
E-Cantallar	- /	Ypid DL1	actuating variable	2	5		
Bet locut	8	FD1 61	proportional band 1 [phys]	2	0		
- Print Logic	10	td1	derivative action 1 [s]	2	9		
- For Setpoint	11	(a)			-		
	12						
	13						
	14						
	15						
	16						
	1/						
	10				-		
	20						
	21						-

Additionally or alternatively, any 32 parameters and process data can be selected in common for all channels. For instance, by selection of a datum, e.g. the process values of all (max. 30) channels can be transmitted. In total, up to 960 write and 960 read data can be defined (32 data x 30 channels). With DeviceNet, these data are limited to a total of 127 for each direction.

Bus data (all channels read) - koffer.bct					-	
🐴 🏂 🎭 🔭 👘 Bus data (all channels n	ead) 💌					
Channel 1	1 data (all characterized)       ■         1 data (all characterized)       ■         Ph1       proposition band 1[phy]         Ph1       proposition band 2[phy]         Ph10       characteristic wetworking         Ph10       characteristic wetworking         Ph10       characteristic wetworking         Ph11       proposition band 1[phy]         Ph15       hypitersin ban[hypi]         Ph15       proposition band 1[phy]         Ph16       proposition band 1[phy]         Ph17       proposition band 1[phy]         Ph1       proposition band 1[phy] <td< th=""></td<>					
	All channels excell - kotifie ket         Image: Second					
E- KS vario						
Parameter	Pb1	proportional band 1 [phys]				
Channel data	РЬ2	proportional band 2 [phys]				
Er Controller	61	integral action 1 [s]				
	ti2	integral action 2 [s]	_			
Bet Setpoint		derivative action 1 [s]				
- Bet Limit	102	derivative action 2 [s]				
	10	min. cycle une r [s]				
E Channel data	12	min. cycle une 2 [s]				
- P** Controller	ton	nuls water cooling [s]				
₽++ Input	toFF	min_nulse_nause [s]				
- Bot Logic	E.H20	characteristic watercooling				
— ∰art Setpoint	E.H20	min. temperature [phys]				
Limit	SH	neutral zone [phys]				
	HYS.L	hysteresis low [phys]				
	HYS.H	hysteresis high [phys]				
	H	motor travel time [s]				<u> </u>
	114 × 1	• 4				
	No. Name	Description	Channel	Offset		
	1 X.Eff	effective process value	130	10, 15, 20,, 155		
	2 Ypid	actuating variable	130	11, 16, 21,, 156		
	3 Pb1	proportional band 1 [phys]	130	12, 17, 22,, 157		
	4 61	integral action 1 [s]	130	13, 18, 23,, 158		
	5 td1	derivative action 1 [s]	Channel         Offset			
	6					
	/					
	•					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					<b>_</b>

These selected data are available in the cache memory of KS vario in the order defined in BlueControl. The indexes or offsets of the individual data are displayed via the BlueControl tool and can be printed out.

### **3.3.** Structure of the data cache in KS vario

The process data cover a data range of 1080 word data in the write cache and in the read cache.



As a Rockwell PLC accepts only max. 127 data words per direction, all data in excess of this amount selected by means of the BlueControl tool are not transmitted (displayed with red background), truncated!

#### Layout of the data cache:

Index read cache	Content
1 up to 120	Any data of any channels
from 121	Selected data (identical for all channels): All channel 1 data All channel 2 data  All channel 30 data
max. 127	

Index write cache	Content
1	Any data of any channels
up to 120	
from 121	Selected data (identical for all channels):
	All channel 1 data
	All channel 2 data
	All channel 30 data
up to 127	

#### 3.4.

#### Example

Example

The bus data (read/write) which should be transmitted can be composed by selecting them accordingly. An example for channel-specific data selection is given below:

Busdaten	(lesen)		<b>_</b>			
Kapal 1 💌	Kürzel	E	Bezeichnung			
Busdaten (lesen) - vario-dn-do         Image: Strain Strain         Image: Strain         Image: Strain	Cntr	F	Regler			
- Rarameter	0.01				_	
Image: Set of the set of th	L.Sta		legierstatus			
	T pid	2	teligroise	_	_	
	A.Eff	E	rrektiver istwert		_	
	SP.EF	V	virksamer Sollwe	arc	_	-
	- dirr		legelabweichur	ig :0	_	
	DYman	0	tellarioRepuerat	be (diff)	_	-
	Vinc		Stellwert inkreme	ioe (uiir) iot	-	
	YDec			rement		
	PCha			hen		
	Nr. Kürzel	Bezeich	nung	Kanal	Offset	
	1 X.Eff	Effektive	er Istwert	1	0	
	2 Ypid	Stellgröß	3e	1	1	
	3 C.Sta	Reglerst	atus	1	2	
B* Sollwert	4	_				
B* Grenzwerte	5					
	6					
	1	-				
	8	-		-		
	10			-		
	11					1
	12			-		1
	13	1				1
	14					1
	10					-

Busdaten (schreibei	ı) - vario-dn-d	loku	.bct		area ( )		_ 0	×
	Busdaten (so	chreib	en)		<u> </u>			
Kanal 1		Kürz	el		Bezeichnung			
		LOG	il		Logik		_	
B Auben	eiter 3	CD C	00		LL L K (CD 2		-	
E Gerät	lokor o	SP.SP2			Umechaltung auf Y2			
B* Alloem	ein	T.Y2			Umschaltung auf Hand			
=== Extern	этк 🔤	L C Off			Beder ausschalten			
- Canaldaten		A Be			Error ist Beset			
- P* Regler		Boost			Boostfunktion ein			
- 🗗 Param	etersatz 2	P.1	2		Parametersatz Umsch	altuna	_	
📑 🕂 Eingän	ige	A.Si	-		Zusammenfassung Ste	uersian	ale	
- ₽+ Sollwe	rt	C.St	euer		Steuerwort des Regler	s		
📑 Grenzv	verte							
🖻 🧰 Signale						-	-	
🖻 🧰 System		帽	$\times 1$	<b>}</b> + +				
一音* Digitale	e Eingänge	M.	Kilmel	Dennie	han an a	Kanal	06	i.
E Ausgange		191.	CD	Sellue	nnung	Kanai 1	Unset	F
- Status	digital	2	JF	Manua	t lle Ctellarioùen veraek e	1	1	H
- B Status	analog	2	A Man	Umeeh	altung auf Hand	1	2	r
Heizstr	om	4	CON	Begler	ausschalten	1	3	
Set Forcing	y uigitai	5	0.01	region	adovernanceri			1
Gerät	y analog	6						
Bet Gerät		7		1				1
B* Alarme		8						1
- Kanaldater	1	9		d.				1
₽* Realer		10		1				]
🛱 🕈 Eingän	iqe	11		1				]
- P+ Logik	-	12		2				
B* Sollwe	rt	13						
📑 Grenzv	verte	14		2				
						-		11.12

In the example, 3 read data (to be read from KS vario) and 4 write data (to be written into KS vario) are defined. The resulting I/O poll size must be specified as bytes in the DeviceNet scanner:

Edit I/O Parameters : 04, KS vario	? ×
Strobed: Input Size: Bytes Use Output Bit:	Change of State / Cyclic Change of State C Cyclic Input Size:
<ul> <li>✓ Polled:</li> <li>Input Size:</li> <li>6 → Bytes</li> <li>Output Size:</li> <li>8 → Bytes</li> <li>Poll Rate:</li> <li>Background</li> </ul>	Output Size:     Image: Bytes       Heartbeat Rate:     250     msec       Advanced
OK Cancel	Restore I/O Sizes

As all bus data are transmitted as "word", 6 bytes for read data (input)and 8 bytes for write data (output) must be specified. The "Poll Rate" should be set to "Background" (the cycletime of KS vario is 100 ms).



<sup>1</sup> If the number of read/write data selected in the BlueControl tool (total of channel and individual data) does not correspond with the size adjusted in the scanner, I/O data communication is not possible.

#### **3.5.** Communication with the PLC at the example of Rockwell with RSNetWorx

The settings required for communication of KS vario DeviceNet with a PLC is described at the example of a Rockwell PLC and network configuration tool RSNetWorx. For further details related to the Rockwell components, see the relevant documentation.

#### 3.5.1 EDS installation and network configuration with RSNetWorx

Communication of the PLC with the DeviceNet fieldbus is via the "Scanner", a DeviceNet master node, which is directly allocated to the PLC. The devices connected in the network are made known to the scanner via RSNetWorx.



We recommend specifying KS vario as a new hardware first. This is done using the EDS Wizard, which can be found in the Tools of RSNetWorx.

In the following dialogue, specify the required EDS file. Various possibilities can be selected:

gistration	
Electronic Data Sheet file(s) will be add Software applications	ed to your system for use in Rockwell
Register a single file	
Register a directory of EDS files	Look in subfolders
Named:	
E:\InControlModular\DeviceNet\Dol	ku\ks-vario-dn_8ch.eds Browse
* If there is an icon file (.ico)	with the same name as the file(s) you are registering
* If there is an icon file (.ico) then this image will be assoc	with the same name as the file(s) you are registering iated with the device.
* If there is an icon file (.ico) then this image will be assoc	with the same name as the file(s) you are registering iated with the device. To perform an installation test on the file(s), click N
* If there is an icon file (.ico) then this image will be assoc	with the same name as the file(s) you are registering iated with the device. To perform an installation test on the file(s), click N
* If there is an icon file (.ico) then this image will be assoc	with the same name as the file(s) you are registering iated with the device. To perform an installation test on the file(s), click N

- a) <u>ks-vario-dn\_8ch.eds</u> 8-channel without Conf data
- b) <u>ks-vario-dn\_30ch.eds</u> 30-channel without Conf data
- c) <u>ks-vario-dn\_30ch+config.eds</u> 30-channel with Conf data

#### Note:

The times required for loading/picture build-up increase considerably from a) to c) ! Up to 30 minutes with c) !

An icon for the newly registered hardware can be defined subsequently:

Rockwell Software's EDS N Change Graphic Image You can change the c	Vizard a raphic image that is associated with a device.	×
Change icon	Product Types	
	<zuriick weiter=""> Abbr</zuriick>	echen

EDS files and icon can be downloaded as a ZIP archive from the PMA homepage.

After successful installation of the EDS file, KS vario can be selected by following path "DeviceNet => Vendor => PMA => Generic Device" in the "Hardware" window of RSNetWorx:



The 2 possibilities for integration into the network are on-line scan or the off-line engineering described in the following chapter. For this, position the new node via drag & drop and change the properties using the context menu (by klicking with the right mouse key) "Properties".



Example: Changing the MAC-Id into 4

Vendor:         PMA [544]           Type:         Generic Device [0]	
Type: Generic Device [0]	
Device: KS vario [7376]	
Catalog: KSVC-104-10xx1	
Revision: 1.001	

1788-DNB0 ? ×	
General Module Scanlist Input Output ADR Summary	: 🔸 📰 🌌
- 1788-DNBO	KS vario
Name: 1788-DNBO	ñ
Description:	
	04
Address: 1	
Device Identity [ Primary ]	
Vendor: Rockwell Automation - Allen-Bradley [1]	
Type: Communication Adapter [12]	
Device: 1788-DNBD [81]	
Catalog: 1788-DNB0	
Revision: 2.002	
OK Abbrechen Übernehmen Hilfe	
	-

After positioning all nodes, further configuration is in the DeviceNet scanner.

Scanner 1788-DNBO (for example PLC 1794)

In item "Scanlist", the "Available Device" KS vario can be entered into the "Scanlist".

After selecting in the "Scanlist" and pressing "Edit I/O Parameters...", the default setting is displayed:

The Input/Output Size of 254 bytes (127 data words each) is the <u>maximum possible</u> value (read from the EDS) ! The really available sizes are dependent on the bus data composition via BlueControl.

	1788-DNB0	<u>? ×</u>	
	General Module Scanlist Input	Output ADR Summary	🔸 🐺 🟅
General Module Scanlist Input     Output     ADR     Summary       Available Devices:     Scanlist:     KS vario	Available Devices:	Scanlist:	KS vario
III 04, KS vario	Edit I/O Parameters : 04, KS vario	?>	
Cold / O Parameters 104, K5 vario     Y       Strobed:     Input Size:     Imput Size:       Use Dutput Bit:     Imput Size:     Imput Size:       V Polled:     Imput Size:     Imput Size:       Input Size:     54     Bytes       Output Size:     59     Bytes       Poll Rate:     Every Scan       Every Scan     Advanced       OK     Cancel	Strobed: Input Size: Use Dutput Bit: Polled: Input Size: 254 Bytes Dutput Size: 254 Bytes Poll Rate: Every Scan OK Cancel	Change of State / Cyclic Change of State C Cyclic Input Size: Uutput Size: Uutput Size: Uutput Size: Uutput Size: Uutput Size: Uutput Size: Uutput Size: Uutput Size: Uutput Size: Restore I/D Sizes	

The values must be set to the real sizes, otherwise, communication is not possible ! Moreover, KS vario should not be polled at a higher rate than 80 - 100ms, since new data are available only at intervals of 100ms. This results mostly in "Background" operation, provided that faster I/O operation is required.

When acknowledging the entry, a warning related to differences of "Connection Size" is displayed, because comparison is using the maximum value from the EDS file. Confirm this warning by clicking on "Ja" (yes).

Scanner (	Configuration Applet
<u>.</u>	Warning: The connection sizes that you've entered differ from that expected by the device. If you choose Yes to continue, the connection to the device may fail. To restore the sizes back the default expected by the device, click the Restore I/O sizes button. Do you want to continue using the values that you have manually entered?

This may be followed by an "Unmap" prompt, Confirm again with "Ja".

Scanner	Configuration Applet			
?	The changes that have been made require some I/O data to be Unmapped Are you sure you want to continue?			
	Ja Nein			

Moreover, a prompt for automatic mapping of the new I/O data is displayed. Dependent on project and scope of possible changes, confirm with "Ja (yes)" or "Nein (no)" ("Unmap" and "Automap" can be selected via items "Input" and "Output").

Scanner	Configuration Applet
?	The changes that have been made result in additional I/O data that is not mapped. Do you want to Automap this data?
	Ja Nein

Checking / modifying the I/O mapping is possible via "Input" or "Output":

1788-DNBO	1788-DNBO
General Module Scanlist Input Output ADR Summary	General Module Scanlist Input Output ADR Summary
Node Type Size Map AutoMap	Node Type Size Map AutoMap
Unmap	Unmap
Advanced	Advanced
Options	Options
Memory: Assembly Data 💌 Start DWord: 0 💼	Memory: Assembly Data 💌 Start DWord: 0 📩
Bits 31 - 0         0           2l.Data[0]         04, KS vario           2l.Data[1]         04, KS vario           2l.Data[2]         04, KS vario           2l.Data[2]         04, KS vario           2l.Data[3]         04, KS vario           2l.Data[4]         04, KS vario           2l.Data[5]         04, KS vario           2l.Data[6]         04, KS vario           2l.Data[7]         04, KS vario           2l.Data[7]         04, KS vario           2l.Data[8]         04, KS vario	Bits 31 · 0         2:0.Data[0]       04, KS vario         2:0.Data[1]       04, KS vario         2:0.Data[2]       04, KS vario         2:0.Data[3]       04, KS vario         2:0.Data[4]       04, KS vario         2:0.Data[5]       04, KS vario         2:0.Data[6]       04, KS vario         2:0.Data[6]       04, KS vario         2:0.Data[6]       04, KS vario         2:0.Data[7]       04, KS vario         2:0.Data[8]       04 KS vario
OK Abbrechen Übernehmen Hilfe	OK Abbrechen Übernehmen Hilfe

"Summary" provides a summarizing survey of the node I/O mapping:



Adjustment of the general communication parameters for the DeviceNet network is in item "Module". "Interscan Delay" is the setting for the cyclical poll speed (for "Every Scan" nodes). The "Foreground to Background Poll Ratio" defines the ratio of "Every Scan" and "Background" operated nodes.

1788-DNB0	<u>? ×</u>
General Module Scanlist Input Output	ADR Summary
Interscan Delay: Interscan Delay: msec Foreground to Background Poll Ratio: 5	Upload from Scanner Download to Scanner Module Defaults
	Slave Mode
	Advanced
- 1756-DNB: Slot: 2	
OK Abbrechen	Übernehmen Hilfe

With an "Interscan Delay" of 100ms, the "Every Scan" nodes are polled at intervals of 100ms. "Foreground to Background Poll Ratio" 5 defines "Background" node polling at intervals of 600ms. After clicking on "Advanced...", special settings are possible; however, these settings are reserved for DeviceNet experts.

			un pominary
Intersca	n Delay:	⊡ msec _	Upload from Scanner
Foregro Backgr	und to ound Poll Ratio: 5	-	Download to Scanner
			Module Defaults
Ad	vanced Module Setting	15	?   ×
	WARNING: Modifying these	settings may	disrupt network
	MARNINIa: Modifying these communication. instructed to do representative.	settings may Do not modil so by a techi	disrupt network iy unless nical support
-15	WARNING: Modifying these communication. instructed to do representative. Expected Packet Rate:	settings may Do not modil so by a techi	disrupt network y unless nical support
-1;	WARNING:     Modifying these     communication.     instructed to do     representative.     Expected Packet Rate:     Transmit Retries:	settings may Do not modil so by a techn	disrupt network y unless nical support

After completing, the scanner configuration must be stored by "Download" in the scanner.

1788-DNB0	? ×
General Module Scanlist Input Output ADR Summary	, <b>-</b> 🐺
1788-DNBO	KS va
Name: 1788-DNBO	
canner Configuration Applet	×
Do you want to upload the configuration from the device, upda     software's configuration; or download the software's configuration     the device, updating the device?     For more information, press F1     Upload Download Cancel	ting the U4
Device: 1788-DNB0 [81] Catalog: 1788-DNB0 Revision: 2.002	

Now, network scanning ("browsing") can be done by switching over to "Online". Found nodes are displayed in parallel to the progress bar.

1788-DNBO	KS vario
1	
201	04

Fo	ind: Device at address 04	
	Cancel	

Network configuration is completed.

3

#### 3.5.2 Example: DeviceNet communication procedure (PLC <--> KS vario)

The communication examples shown below are based on the following settings: scanner set to MAC-Id 1, KS vario set to MAC-Id 4, CAN analyzer (for Explicit Message Access) works with MAC-Id 63.

# KS vario is a "Group 2 Only Server" with a "Predefined Master/Slave Connection Set" in compliance with the ODVA DeviceNet specification.

#### KS vario boot

ID	Src	Dst	R/R	Service/Data	Data
427		04	Rq	'Dupl.MAC check' Serial 1090f78a Port 00 PMA GmbH	00 20 02 8a f7 90 10
427		04	Rq	'Dupl.MAC check' Serial 1090f78a Port 00 PMA GmbH	00 20 02 8a f7 90 10

After booting, KS vario displays a "Duplicate MAC Check", which provides the unique serial number in addition to the vendor-Id (0x220 = 544).

#### **PLC Connect**

ID	Src	Dst	R/R	Service/Data	Data
781	01	04	Rq	'Open expl msg con' DN16/16 Grp 3 SrcMId 4	04 4b 02 34
781	01	04	Rq	'Open expl msg con' DN16/16 Grp 3 SrcMId 4	04 4b 02 34
426	01	04	Rq	'Alloc Master/Slave' Cl 3(DNet) Ins 1 Choice Expl Master 1	01 4b 03 01 01 01
423	04	01	Rsp	'Alloc Master/Slave' DN8/8	01 cb 00
424	01	04	Rq	'Alloc Master/Slave' Cl 3(DNet) Ins 1 Choice Poll Master 1	01 4b 03 01 02 01
423	04	01	Rsp	'Alloc Master/Slave' DN8/8	01 cb 00
424	01	04	Rq	'Get Attr Single' Cl 1(Identity) Ins 1 Attr 1(VendorID)	01 Oe 01 01 01
423	04	01	Rsp	'Get Attr Single': 20 02 (0220)	01 8e 20 02
424	01	04	Rq	'Get Attr Single' Cl 1(Identity) Ins 1 Attr 2(DevType)	01 Oe 01 01 02
423	04	01	Rsp	'Get Attr Single': 00 00 (0000)	01 8e 00 00
424	01	04	Rq	'Get Attr Single' Cl 1(Identity) Ins 1 Attr 3(ProdCode)	01 Oe 01 01 03
423	04	01	Rsp	'Get Attr Single': d0 1c (1cd0)	01 8e d0 1c
424	01	04	Rq	'Set Attr Single' Cl 5(Cnxn) Ins 1 Attr c(wdToAction): 03	01 10 05 01 0c 03
423	04	01	Rsp	'Set Attr Single'	01 90
424	01	04	Rq	'Set Attr Single' Cl 5(Cnxn) Ins 2 Attr 9(ExpPRate): 4b 00 (004b)	01 10 05 02 09 4Ъ 00
423	04	01	Rsp	'Set Attr Single': 4c 00 (004c)	01 90 4c 00
424	01	04	Rq	'Get Attr Single' Cl 5(Cnxn) Ins 2 Attr 7(PrdCnSz)	01 Oe 05 02 07
423	04	01	Rsp	'Get Attr Single': 36 00 (0036)	01 8e 36 00
424	01	04	Rq	'Get Attr Single' Cl 5(Cnxn) Ins 2 Attr 8(CnsCnSz)	01 Oe 05 02 08
423	04	01	Rsp	'Get Attr Single': 5a 00 (005a)	01 8e 5a 00

The PLC opens communication channels for "Explicit Message" and "Polling" (the first attempt [2 \* open expl msg con] to communicate via UCMM stops with timeout, because KS vario as a "Group 2 Only Server" does not support UCMM). Subsequently, various attributes of identity and connection class are read or written.

#### ExpIMsg Read

Example for read access (via "Explicit Message") on the PMA Vendor-Id.

ID	Src	Dst	R/R	Service/Data	Data
7bf	3f	04	Rq	'Open expl msg con' DN16/16 Grp 3 SrcMId 0	04 4Ъ 02 30
7bf	Зf	04	Rq	'Open expl msg con' DN16/16 Grp 3 SrcMId 0	04 4b 02 30
426	Зf	04	Rq	'Alloc Master/Slave' Cl 3(DNet) Ins 1 Choice Expl Master 3f	3f 4b 03 01 01 3f
423	04	Зf	Rsp	'Alloc Master/Slave' DN8/8	3f cb 00
424	Зf	04	Rq	'Get Attr Single' Cl 1(Identity) Ins 1 Attr 1(VendorID)	3f 0e 01 01 01
423	04	Зf	Rsp	'Get Attr Single': 20 02 (0220)	3f 8e 20 02
426	Зf	04	Rq	'Release Master/Slave' Cl 3(DNet) Ins 1 RelChoice Expl	3f 4c 03 01 01
423	04	Зf	Rsp	?'Release Master/Slave'	3f cc

#### **ExplMsg Write**

Example for a write access (via "Explicit Message") to the MAC-Id (4 => 5). After changing, KS vario displays a "Duplicate MAC Check" (new MAC-Id).

ID	Src	Dst	R/R	Service/Data	Data
7bf	3f	04	Rq	'Open expl msg con' DN16/16 Grp 3 SrcMId 0	04 4Ь 02 30
7bf	Зf	04	Rq	'Open expl msg con' DN16/16 Grp 3 SrcMId 0	04 4b 02 30
426	Зf	04	Rq	'Alloc Master/Slave' Cl 3(DNet) Ins 1 Choice Expl Master 3f	3f 4b 03 01 01 3f
423	04	Зf	Rsp	'Alloc Master/Slave' DN8/8	3f cb 00
424	Зf	04	Rq	'Set Attr Single' Cl 3(DNet) Ins 1 Attr 1(MAC ID): 05 00 (0005)	3f 10 03 01 01 05 00
423	04	Зf	Rsp	'Set Attr Single'	3f 90
42f		05	Rq	'Dupl.MAC check' Serial 1090f78a Port 00 PMA GmbH	00 20 02 8a f7 90 10
42f		05	Rq	'Dupl.MAC check' Serial 1090f78a Port 00 PMA GmbH	00 20 02 8a f7 90 10

**I/O polling (request/response)** The example illustrates the transmission of 45 write data (90 bytes) and 27 read data (54 bytes). Transmission is as a "fragmented transfer", i.e. each message contains a status byte (start/end/count info) and 7 data bytes.

ID	Src	Dst	R/R	Service/Data									Data	а						
425		04	Rq	IO Poll:	00	00	01	00	02	00	03	00	00	00	01	00	02	00	03	00
425		04	Rq	IO Poll:	41	04	00	05	00	06	00	07	41	04	00	05	00	06	00	07
425		04	Rq	IO Poll:	42	00	08	00	09	00	0a	00	42	00	08	00	09	00	0a	00
425		04	Rq	IO Poll:	43	ΟЪ	00	0c	00	00	00	00	43	ΟЪ	00	0c	00	00	00	00
425		04	Rq	IO Poll:	44	00	00	00	00	00	00	00	44	00	00	00	00	00	00	00
425		04	Rq	IO Poll:	45	00	00	00	00	00	00	00	45	00	00	00	00	00	00	00
425		04	Rq	IO Poll:	46	00	00	00	00	00	00	01	46	00	00	00	00	00	00	01
425		04	Rq	IO Poll:	47	00	01	00	00	00	00	00	47	00	01	00	00	00	00	00
425		04	Rq	IO Poll:	48	00	00	00	00	00	00	00	48	00	00	00	00	00	00	00
425		04	Rq	IO Poll:	49	00	00	00	00	00	00	00	49	00	00	00	00	00	00	00
425		04	Rq	IO Poll:	4a	00	00	00	00	00	00	00	4a	00	00	00	00	00	00	00
425		04	Rq	IO Poll:	4Ь	00	00	00	00	00	00	00	4Ь	00	00	00	00	00	00	00
425		04	Rq	IO Poll:	8c	00	00	00	00	80	01		8c	00	00	00	00	80	01	
3c4	04		Rsp	IO Poll:	00	0f	01	ff	00	f O	00	0a	00	0f	01	ff	00	f 0	00	0a
3c4	04		Rsp	IO Poll:	41	01	fЬ	00	ec	00	06	01	41	01	fЬ	00	ec	00	06	01
3c4	04		Rsp	IO Poll:	42	80	01	e8	86	e8	86	e8	42	80	01	e8	86	e8	86	e8
3c4	04		Rsp	IO Poll:	43	86	e8	86	e8	86	e8	86	43	86	e8	86	e8	86	e8	86
3c4	04		Rsp	IO Poll:	44	e8	86	e8	86	e8	86	e8	44	e8	86	e8	86	e8	86	e8
3c4	04		Rsp	IO Poll:	45	86	e8	86	e8	86	e8	86	45	86	e8	86	e8	86	e8	86
3c4	04		Rsp	IO Poll:	46	e8	86	e8	86	e8	86	e8	46	e8	86	e8	86	e8	86	e8
3c4	04		Rsp	IO Poll:	87	86	00	ff	ff	Of			87	86	00	ff	ff	0f		

#### **3.6.** Parameter access to KS vario data in RSNetWorx

Due to the complexity of KS vario, the BlueControl engineering tool should be used for configuration an parameter setting, if possible. If necessary, an access to parameters in RXNetWorx is possible as follows:

≟ <b>∮</b> KS vario		? ×
General Paran	neters   1/0 Data   EDS File	
- Прика	S vario	
Name:	KS vario	
Description:		
EDS Editor		×
For more	Upload Download Cancel	
Device:	KS vario [7376]	
Catalog:	KSVC-104-10xx1	
Revision:	1.001	-

Double click on the KS vario icon and select the "Parameter" icon to open the upload dialogue. Activate "Upload" to read the parameters (configurations) based on the EDS file(s).

КS	i vario	
Name:	KS vario	
Description:		
EDS Editor		×
Up	bloading 'Param1448'	
Γ	Cancel	
Туре:	Generic Device [U]	
Device:	KS vario [7376]	
Catalog:	KSVC-104-10xx1	
Revision:	1.001	



Dependent on selected EDS file, the upload/display time can be very long (up to 30 min.!).

After selecting "Groups", click on a group for access to the parameters of this group.

KS vario			? ×
General Parame	eters   I/O Data   EDS Fi	le	
Select action	the parameter that you wasing the toolbar.	ant to configure and initiate	an
Groups	😽 觼 Single	💌 🔿 <u>M</u> onitor 🛛 🍓	a 🐴
ID 🔒	🔄 Parameter	Current Value	
📄 Paramete	er - System: line con	ductor 1	
🖶 Paramet	er - System: line con	ductor 2	
- 5813	∉ InLP2	0.0	
- 5814	🗄 OuLP2	0.0	
- 5815	🗄 InHP2	100.0	
<sup>i</sup> 5816	éé OuHP2	100.0	
📄 🛅 Paramete	er - System: line con	ductor 3	
📄 庙 Paramet	er - Device: General		
📄 <u> </u> Paramet	er - Device: External	TC	
📄 🗋 Paramet	er - Channel [01]: Co	ontroller	
📄 庙 Paramete	er - Channel [01]: Pa	ram set 2	
📄 <u>वि</u> Paramete	er - Channel [01]: In	put	
📄 <u>वि</u> Paramete	er - Channel [01]: Se	tpoint	
📄 급 Paramet	er - Channel [01]: Lir	nit	
Parametr	er - Channel [02]: Co	ontroller	-
	OK Abbrecher	n Übernehmen	Hilfe

Switch over to "Start Configuration" for writing configuration data. Don't forget "End Configuration" at the end !)



# **4. KS vario DeviceNet "Object directory"**

Apart from the standard DeviceNet classes (Identity, Message Router, DeviceNet, Assembly, Connection ...), which are not described in detail in this manual, there are also manufacturer-specific classes, instances and attributes.

The following table provides a survey of KS vario data objects (parameters, signals, configurations) and and related "addresses" (class, instance, attribute). Bus access to these data is possible via "Explicit Messaging".

For a description of the individual data (not addresses), see the KS vario parameter table.



A detailed address survey of all data is given in document:: Parameter table for KS vario (9499-040-72918) - available

- available from Feb. 2005 on www.pma-online.de - and on request up to this date

9499-040-70018