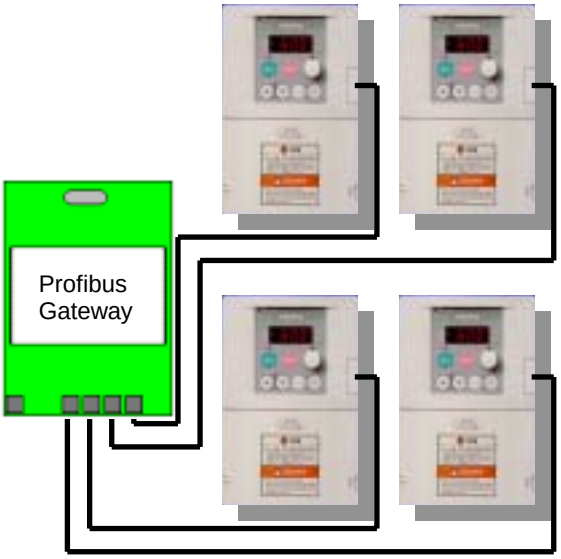
Product Manual

Profibus DP

TOS-S7-PB Gateway

for TOSHIBA - Inverter

VF- S7, S9, S11, A7, P7, nC1



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Gateway PROFIBUS DP

Important Instruction

This manual has been compiled with great care. However, ESCO EUGEN SCHMIDT UND CO does not undertake any responsibility for incorrect representation or unmentioned technical corelations. Especially, any liability for the damages that result due to the use of this techinical manual is not accepted.

The products and the functions described in this documentation can be modified to suit the latest technological development anytime. The information given in this manual cannot be held valid contractually.

Contents

1 Introduction

Following operational instructions are for the purpose of safe working TOSHIBA VF S7 series frequency converter (Inverter) with Profibus switiching module TOS - S7 - PB , which is also refered below as “Profibus-module“.

All the safety instructions laid out here must be observed.

All the persons, who work with Profibus-Module, must have access to this operational instructions. All specifications are to be observed.

This documentation must be applied in complete form and unrestricted condition.

In order to ensure trouble free operation, please read the manual before using the module.

1.1 Delivery-Kit

Delivery-Kit contains:

- One Profibus-Modul TOS - S7 - PB with plug-in connector for the external 24V DC power supply.
- One connecting cable CAB - VF - BUS for connecting Profibus-Module to Inverter.
- One Diskette with GSD-data
- An Installation Advice

1.2 Application

Profibus-Module should be used only under the installation-requirements described in this technical documentation.

The Profibus-Module is an option for TOSHIBA Inverter VF S7. S7 series is fitted with serial interface(TTL). The Profibus-Module TOS - S7 – PB enables each module to be connected to up to four TOSHIBA Inverters VF S7 on to Profibus DP.

Via the Profibus, the VF S7 inverter with the connected module, can be programmed or controlled through Control Words or Objects described below. In addition to that, all the parameters and variables of VF S7 can be read and written without any restrictions.

The Profibus-Modlue should be installed and connected as per the specifications and in such a way that by orderly and correct use, no personnel danger should occur in the normal operation.

The safety instructions described here must be observed without fail.

It should be ensured through suitable measures that no personnel or equipment damage results due to failure of Profibus-Module.

Any other use is prohibited.

1.3 Valid Specifications:

The information, Data and instructions contained in this document is complied very carefully as per the development and publishing of the latest- up to the version availiable at the time of compilation. From the hints, diagrams and descriptions contained in this documentation no claims can be made for the revisions of the Profibus-Module.

For the suitability of the indicated procedures and circuits**,** EUGEN SCHMIDT UND CO does not take any guarantee or liability.

Every liability and guarantee is invalid when damages occur due to :

- Inappropriate use of Technical Documentation
- Invalid application and installation
- Unauthorized modification of the Profibus-Module or its connection to the VF S7 inverter
- Requirement failure

2 Safety Instructions

2.1 Safety Instructions- General

These safety instructions do no claim for the completeness. For any queries on problems, please contact EUGEN SCHMIDT UND CO.

The Profibus-Module corresponds to the version avaiable for the technology at the time of writing this manual and is considered as reliable.

From the Profibus-Module, dangers can occur if:

- an unqualified person works with the Profibus-Module
- the Profibus-Module is used incorrectly.

The hints given in this documentation are only suggestions and must be checked when applying to each application for their feasibility and functionalilty.

Hence, considerable care must be taken so that through any defect or fault in the Profibus-Module, no personnel or equipment damage can occur.

This total drive system must be put into operation only in trouble free condition.

Changes and modifications on the Profibus-Module are fundamentally denied. Any self modification or change without conformation from and in agreement with EUGEN SCHMIDT UND CO invalidates any guarantee and responsibility.

While installing this module, it is important to follow correct connections to all the active components(Profibus-Module, Inverter etc.) for avoiding possible EMC interference, all the general known wiring rules should be adopted (e.g correct voltage balance, flat surface earthing of screens, contrator switching with suitable RC-combination etc.) The module should be earthed through earthing connector.

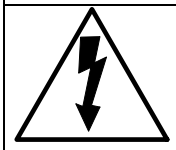
2.2 Symbols of Safety Intructions

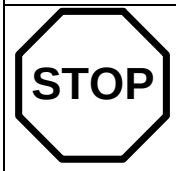
All the safety instructions in this technical book are depicted with common principle
(Pictogramm)

↓ **Warning word**

Instructions Text

- Depiction of the act of Danger through pictogramm
- Indication of Level of Danger through warning word.
- Description of the danger as well as advice for avoiding the danger through Instructions test

Used Pitogram	Associated Warning Word	Explanation
	**Warning!**	Warning for a possiblilty of highly dangerous situation Possible consequences by mishandling: Death or sever injuries
	**Careful**	Warning for possiblilty of a highly dangerous situation Possible consequences by mishandling: Low or superficial injuries

Used Pitogram	Associated Warning Word	Explanation
	**Stop!**	Warning for possible equipment damage Possible consequences by mishandling: Damage to Profibus-Module or its surroundings.

Used Pitogram	Associated Warning Word	Explanation
	**Tip!**	Useful tips for easy dealing with Profibus-Module

3 Technical Data

3.1 Mechanical Data

The Profibus-Module TOS - S7 - PB is mounted on a DIN rail

The Profibus-Module TOS - S7 – PB is constructed in IP31

Dimensions: (W.H.D): 90 x 125 x 42 mm aligned

3.2 Ambient Conditions

Standards	EN, IEC
Limits of Vibrations:	0.6g- range 10 to 50 Hz
Max. Ambient Dust Grade	Dust Grade2 as per IEC 664
Max. Relative Humidity:	93% without condensation. (not tropical)
Temperature: Storage Operation	 -25 to 65°C -10 to 50°C

3.3 Electrical Data

Power Supply	External 24V DC
Current Consumption	150 mA
Communication	RS485
Profibus Partner	Slave
Transmission Rate	Max. 12 MBaud
Galvanic Isolation	All 4 channel to Profibus with 600V among one another

3.4 Characteristics:

- Up to max. FOUR Inverters can be connected to one Profibus-Module
- Simple connection of the inverter through Western connector
- Upto 126 partners on the Bus
- Access to all TOSHIBA VF S7 parameters
- Transmission medium: Two core twisted-pair cable, screened
- Automatically adjustable transmission rate
- Physical construction as per standard RS485
- Continuous Monitoring of the connection between Inverter/Profibus-Module
- Separate 24 V DC power supply
- Transmission security over Profibus: Hamming – Distance 5

3.5 Power Supply

Profibus-Module always requires a separate 24V DC supply (150mA), even with TOSHIBA VF S7 inverter switched off.

The internal + 24V power supply of the VF S7, availiable on the terminal of the serial interface and the inverter control terminals cannot be used as power supply for the Profibus module. The Profibus-Module must be additionally supplied with external + 24V DC.

In case VF S7 requires + 24V supply availiable at the terminal strip of the serial interface for creating galvanic isolation between VF S7 and the Profibus-Module, it should be kept in mind that this voltage can be loaded externally only upto 10mA. Otherwise the operation of the inverter is no more reliable.

3.6 Compliance with standards

CE Marking:	Existing (EN 50178)
Protections against electrosatic discharge (ESD)	IEC I000-4-2-Level3
Immunity against stray electromagnetic field over Radio frequency	IEC 1000-4-3 Level 3
Stability against fast rising electrical impulse (Burst)	IEC 1000-4-4 Level 4
Step Voltage Stability	IEC 1000-4-5 level 3
Immunity against radio interface disturbances coupled with industrial wiring	IEC 1000-4-6 Level 3
Stability against voltage spikes, short time power interruptions and voltage fluctuations	IEC 1000-4-11

3.7 Communication Data

3.7.1 Bus Times

The cycle time of the communication system is the time, in which the entire Control Word and Status Words are exchanged between the Master and the Field device(here: TOSHIBA VF S7). It depends on the data and the transmission rate of the communication system.

Thus :

T_{syn}= The synchronizing time, over which each partner must go through at least one pause before it can begin to accept a call (fixed with 3 bits).

T_{id1}= After the reception of the latest sign of a Telegram, the Initiator has to wait for this time, before it can send the next telgram . This times must be at least the time T_{syn} plus a safety margin.

T_{SDR}= The time, that a slave requires for answering.

min T_{SDR}= The time that a slave must wait for, before it can answer.

max T_{SDR} = The latest time within which a slave must respond.

The exact times are shown in following table:

Tranmission Rate [kBit/s]	9,6	19,2	45,45	93,75	187,5	500	1500	3000	6000	12000
min T_{SDR} in t_{Bit}	11	11	11	11	11	11	11	11	11	11
max T_{SDR} in t_{Bit}	60	60	60	60	60	100	150	800	800	800

3.7.2 System Respponse Time

The system response time of Profibus system mainly depends on the follwoing factors:

- The response time within which a partner can asnwer (T_{SDR})
- The transmission rate (Baudrate)
- Min_Slave_Interval (in Profibus-Module TOS - S7 - PB < 100µs)
- The agreed raw data length

Explanation of the used short-forms:

T_{MC} = Time cycilcal messsage(Demand Telegram + T_{SDR} + Response from slave)

T_{BC} = Bus Cycle time; derived from the addition of message-cycles. For multi-master cases individual cycles are to be added.

T_{SDR} = 30 T_{Bit} at Baud rates greater than 1.5 Mband with Asic SPC3 used in Profibus-Module TOS-VF-PB

T_{Bit} = Time for transmission of a Bit.

In Data Excahnge there exisits a Telegram header of 9 Bytes. The pause time of the Bus results simultaneously from T_{syn}= 33 T_{Bit} and T_{iD1} = 75 T_{Bit}.

The formula for calculation of the Messge Cycle time is given by:

T_{MC} = (2x length of the Headers in Bytes) * 11 Bit+ T_{SDR} + T_{syn} + T_{ID1} (in Bit)

3.7.3 Operational Time in TOSHIBA VF S7 inverter

The operational time in VF S7 inverter is given by addition of Bus Run Time. This operational time is decided with minimum tolerance and amounts to maximum 20 mSec. It is same for all the VF S7 inverters and is applicable for getting access to Profibus-Module on the VF S7 inverter. That means:

- 10 msfor giving information on VF S7 inverter and 10 ms for automatic responses.

That means, in summary:

- 20 ms for the excahnge of Control Words and Status Words
- 20 ms for the reference value and actual value feedback
- 10 ms for accessing a parameter or a variable of an inverter.

3.7.4 Achievable Bus Lengths

As shown in the following table, the possible Bus lengths decrease rapidly with increasing transmission rates.

Transmission Rate [kBit/s]	9,6	19,2	45,45	93,75	187,5	500	1500	3000	6000	12000
Max. Bus length [m]	1200	1200	1200	1200	1000	400	200	100	100	100

Hence care should be taken to keep the wiring from the Bus to individual participating units as short as possible in order to avoid unnecessary increase in total wiring length.

Tip!

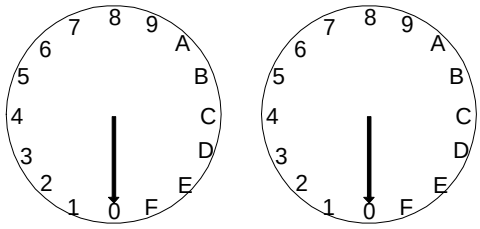
Cable from Profibus to participating unit should not be longer than 6.6m for transmission speed of up to 1500 kbit/sec. For higher transmission speeds, the cable should not be used as reflections from this component negatively influence the transmission performance as well as achievable lengths. In that case connections should be made using plug-in connectors with built-in Bus cable.

4 Hardware Description

4.1 Setting of the Addresses

The addresses of Profibus-Module are set through two Hexadecimal coded rotating switches. The left is coded 16^1, the right one is coded 16^0. Any change of addresses is effective after the revised initialisation of the buses.

The transmission rate is adjusted automatically. The module supports transmission rate up to max 12 MBit/s.



16^1H 16^0H

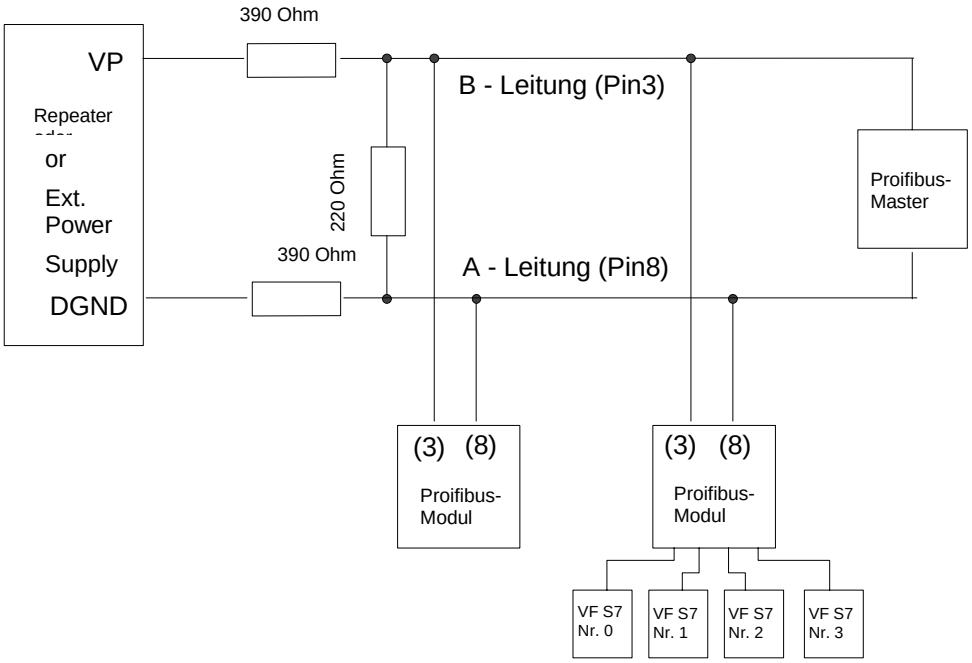
Tip!

The addresses are readable only at the time of intialization.

Any subsequent change is not accepted and the communication to the corresponding participant is no longer possible unless restart comman is given

4.2 Wiring of the Profibus

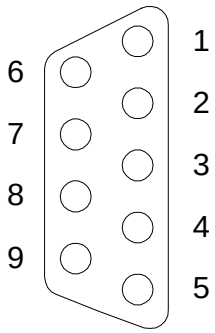
The Profibus accounts for the group of sequentially constructed buses. The wiring is terminated at the end with a 220 Ω Resistance. In addition to this the Bus wiring also has 390 Ω resistance connected to wires VP and DGND.



The above sketch can be considered as an example of building-up of Profibus System.

The terminating resistances are normally soldered inside the connector or otherwise realised through separate circuit at the end of the wiring.

The disposition of 9 Pin Sub-D connectors on the module corresponds the Profibus-Norm EN 50170:



1:	Screen	Screen
2:	M24	Common for 24V output voltage
3:	RxD/TxD-P*****	Receiving/Transmitting Data-P
4:	CNTR-P	Control Signal for repeater
5:	DGND*****	Zero Ref. voltage for 5V
6:	VP*****	+5V Supply voltage of the terminating resist
7:	P24	Output voltage + 24V
8:	RxD/TxD-N*****	Receiving/ Transmitting Data-N
9:	CNTR-N	Repeator Control Signal (Directional Control)

Hint: The pins 3,5,6 and 8 marked with * are mandatory connections.

Tip!

Fault condition can arise if the 1st or the last participant on the Profibus becomes faulty. This fact should be considered carefully while doing the engineering.

Otherwise the regulations and wiring rules of the Profibus user organization are applicable.

4.3 Diagnostic Indication on the Profibus-Module

The Profibus-Module has LEDs for status indication. These LEDs have following meaning:

Indication on the Profibus Module	Colour	Function
+ 5 V	Green	Supervision of the internal operating voltage of the Profibus Modules
Bus Error	Red	Supervision of the communications PB_Netwrok/ Fault Annunciation

4.4 Diagnostic on the Profibus

There is internal supervision of the Profibus-system. In case of interruption on the bus, the Profibus-Module ensures that LED “Bus Error“ on the Profibus-Module lights up and connected VF S7 inverter goes into control stop with fault indication Err5 (Communications Fault).

In case of a break in wiring from a VF S7 inverter to the Profibus-Module, the inverter goes into the safety mode and goes into controilled stop with the fault indication Err5 (Communications Fault). Other inverters connected to this Profibus-Module or other Profibus-Modules are not affected by this.

The seaparately fed Diagnostic-Byte of the Profibus-Module is always reset to the value of zero in healthy condition. In case of fault, following decimal indication of the values of the Diagnostic-Bytes result::

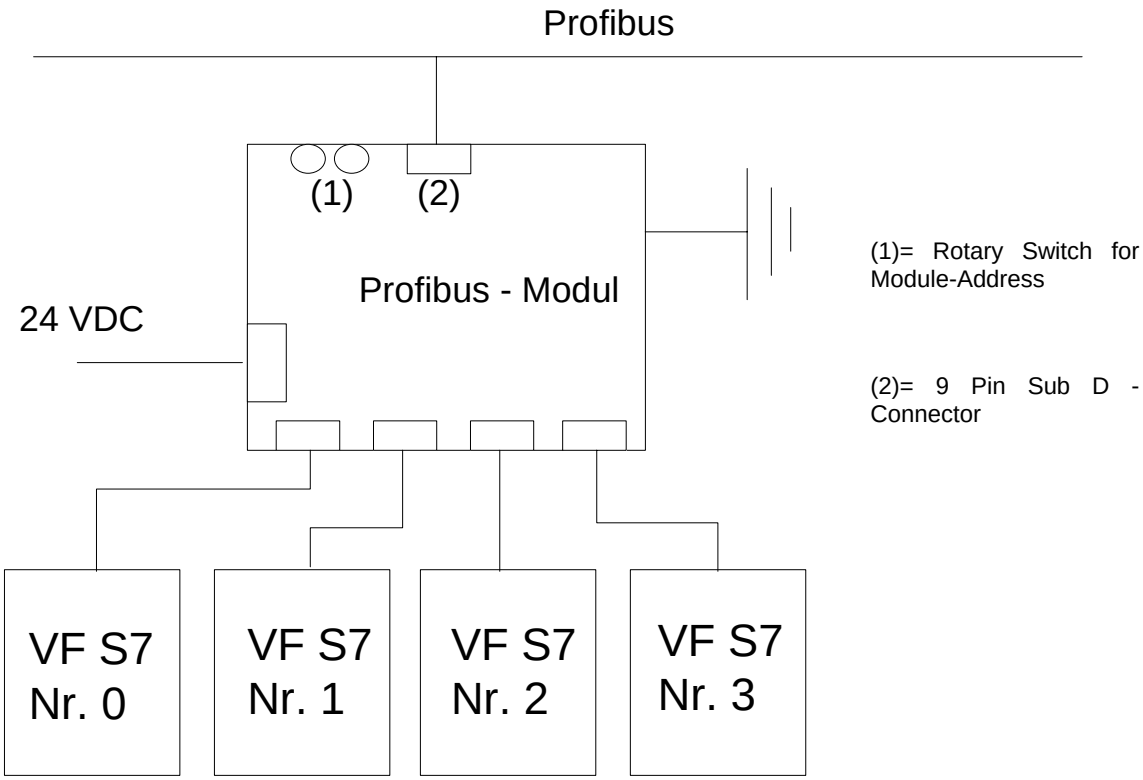
Weightage	Meaning
0	No Fault
1-5	Profibus_module Internal Fault
6	Receiver Buffer Overload for the Profibus-Module.
7- 10	Profibus-Module Internal Fault.
11	Profibus Initialization Fault.
12	SPC3 Fault (User Asic)

Tip!

A fault annunciation should be always reset from the Master so that Profibus-Module can be taken off Fault-status.

4.5 Serial Interface TOSHIBA VF S7

The internal drive addreses of the VF S7 set in the factory are not used. The ranking of the drives from 0 to 3 results from the respective push-in connectors through which the drives are connected with the Profibus-Module as per the following diagram.



For connecting the first inverter VF S7 to the push-in connector of the Profibus-Module TOS - VF - PB , the accompanying cable has to be used. For connecting additional inverters with the push-in connectors 1 to 3 of the Profibus-Module, there is a possibility to order a set of 3 cables (Order Type CAB-VF-BUS)

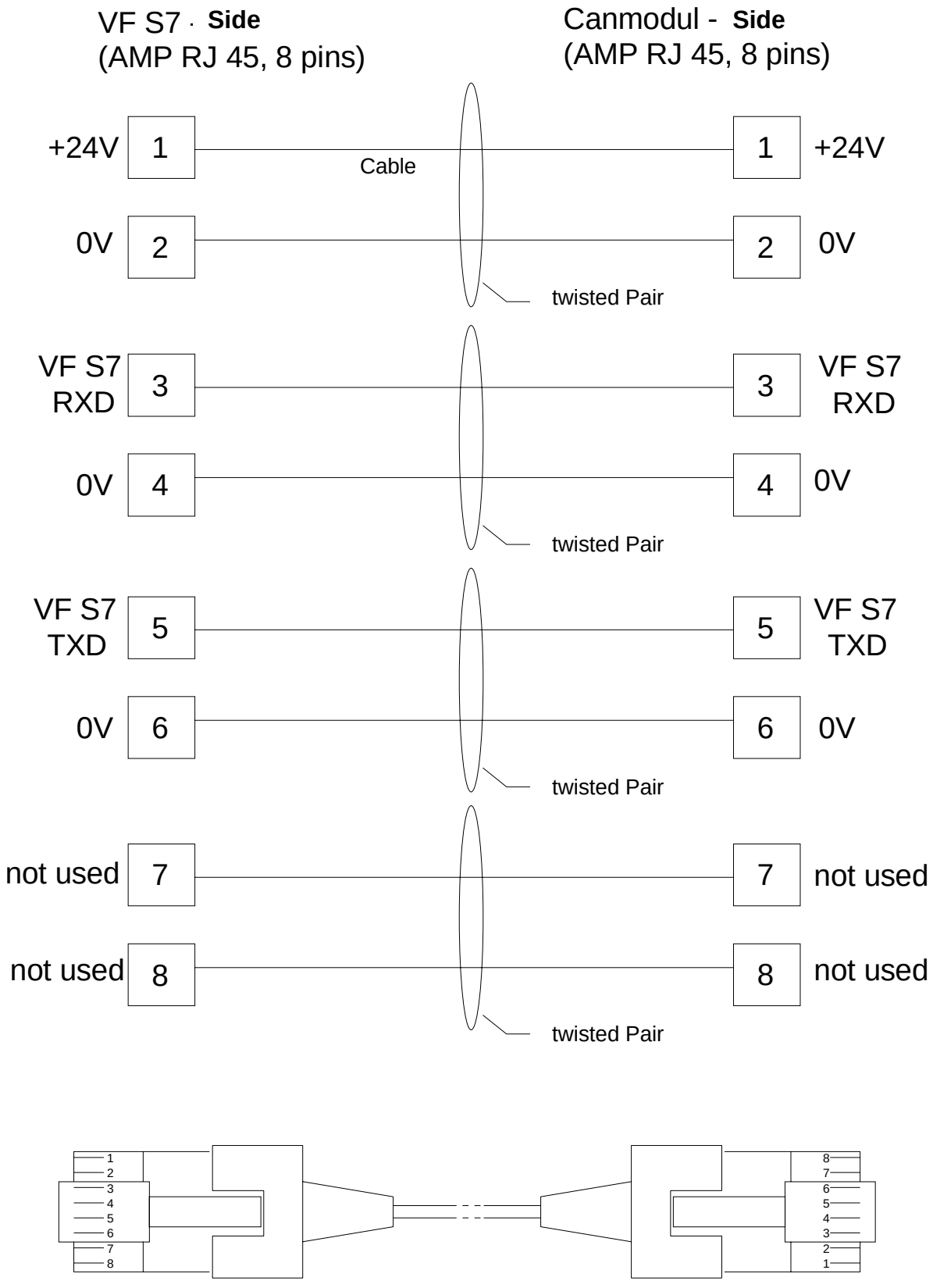
For self-constructed cable, following instructions should be observed.

1) The maximum length of the connecting cable is limited to 1 m.

Each signal receiving channel and transmitting channel (RXD, TXD) must be connected to 0 V.

2) The connecting cable must have eight- pin RJ 45 connecting plug on both the ends.
3) The pins 7 and 8 are not wired, however, Standard cables can be connected at these outputs over an additional Twisted pair.

The configuration of the overall system should be considered from the point of EMC regulations. The Profibus-Module must be correctly earthed.



5 Software Description

5.1 Profibus : General

Under the roof of the Profibus-User organisation (PNO/Karlsruhe), all the Profibus activities are brought together and co-ordinated.The Profibus protocol is finalized as per the European Norm EN 50170.

In order to meet the various requirements of the industrial communication for accountability, there are three Profibus solutions as per the task.

Profibus DP — For quick data exchange in the periphery. (DP = Decentralized Periphery)

Data Unit Byte/ Transmission Time : few 100 µs... 100ms/ Transmission Frequency 10... 100ms)

Profibus FMS — For the object oriented data exchange in cell range and field range (FMS= Fieldbus Message Specification; Data Unit KByte/ Transmission Time: Seconds /Transmission Frequency Std./ min)

Profibus PA — Fulfills the requirements of the process automation and in protected domain.(PA= Process Automation)

The protocol realised in the Profibus-Modul TOS - VF - PB is the Profibus-DP protocol. At layer 1 (physical layer) and layer 2 (safety layer) of the ISO/OSI modules, it is identical to the previous Profibus-FMS protocol. Simply in the layer 7, it differentiates itself from the similar FMS-Protocol. As the user layer is defined in the layer 7, one can view Profibus-DP as standardised application of the layer 2.

The Profibus-DP protocol is basically address oriented in a strict Master-Slave operation. It also allows the multi-master operation as well as mixed operation between Profibus DP and FMS participants.

Practically approx. 90% of all the Profibus-slave solutions realised up to now are DP solutions.

The transmission speeds of Profibus are definitely increased. The Profibus-module TOS - VF - PB supports the highest transmission speed of 12MBit/s specified up to now.

In the realisation of the working profiles of Profibus DP, essentially all the equally comparable profiles of Interbus-S (Drivecom) and CAN (CANopen-Specification) are referred. Hence, it is possible to drive a frequency converter (e.g. TOSHIBA VF S7) with unique control in control-word mode totally independent of the Bus system.

The main Profibus-Telegram construction with Profibus Module TOS - VF – PB is as follows: :

Word 1	Word 2	Word 3	Word 4	Word 5	Word 6	Word 7	Word 8	Word 9	Word 10	Word 11	Word 12	Word 13	Word 14
Control Word 0	Ref. Value 0	Control Word 1	Ref. Value 1	Control Word 2	Ref. Value 2	Control Word 3	Ref. Value 3	Connector No. Command Type	Object No. or Address	Data	Data	Data	Data

Tip!

The Profibus-Module breaks this data string as individual information for the respective inverter. The inverter would be coded as per the connection point (0-3) on the Profibus-Module. Simultaneously, the information on the inverter connected to the Module is passed on , whereby the Control Word has the priority.

With the start of the Profibus system, each Profibus slave module announces itself to the master. Via the GSD data of the module (included in delivery), the master has received the information at the time of configuration of the Profibus systems as to how many Bytes, Status and Control information is processed by the module

The Profibus recognises basically two forms of the data transmission between participants.

- Synchronous Operation
- Asynchronous Operation

In asynchronous operation, the data is sent from Master to the Profibus-Module and the Profibus-Module forwards the data after processing the information to the respective inverter.

In synchronous operation, the data are written and re-sent. They are stored in the Profibus-Module as long as Synch-Telegram is sent. With that all the marked data on the inverter are given forward. This is suitable for, for example, the simultaneous reference value for many inverters.

In the Profibus-Module for the VF S7, the Profile 20-Standardized within Drivecom and supplemented by the „ Velocity Mode“ of the CANopen Profile, is implemented. With this, all the inverters are addressed as per the common principle and value domain, meanings and pre-settings (default values) for the parameters and functions are finalized.

VF S7 Profibus-Module

For all, the profiles of the operating system (Drivecom, CANopen, Velocity Mode Profibus), the chracteristics within the “status mode“ are common. It is important here that the respective transitions can run through one another. The transition with the individual steps and the reactions of the inverter are described in the title 5.4 status Drive TOSHIBA VF S7.

The regulation of the inverter takes place over Control Word and the inverter response over the Status Words. The meaning of the Control Words and the Status Words is thus always the same.

- The Control Word 0 for the inverter at push-in connector 0 is converted into send command 1. The Control Words for the inverters at push-in connector 1-3 are transmitted in the send command 3,5 and 7.
- The Status Word 0 for the inverter at push-in connector 0 is converted into Recieving word 1. The Status Words of the inverters at the push-in connectors 1-3 are converted into receiving words 3,5 and 7.

Over the control word, the Master can issue transition within the status mode. The Profibus-Control Word is identical to its important functions of Drivecom- control word of Interbus-S and CANopen control word.

Through control words, the transition within the status mode and with that, the status of the inverter is signalled to the Master. The transition and status in Profibus-Status Word are mainly taken from Drivecom-statusmode of the Interbus-S and from CANopen-Status Word.

Over the send command 9-14, the individual Objects can be spoken to as per Profibus. The response takes place in Receive command 9-14. Further explanation of the Control and Status Words is given in the following titles.

5.2 Profibus-Control Word

The control word is composed of two Bytes, whose 16 bits have following meaning for the inverter VF S7:

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reference Value switching (1=Terminal strip 0= Profibus)	Direction Switching Right=0(+) Left=1(-)	Not used	VF S7 Enable, Command word Bit 15	Not used	Reserved	Reserved	Stop Stop=1 Run=0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault reset	Depends on operation mode	Depends on operation mode	Depends on operation mode	Operations Enabled	Quickstop	Voltage	Switch-ON

The Bits marked with grey are pre-coded through drive profile of the Profibus DP (Mandatory)

5.2.1 Meaning of the Bits in Control Words

The Bits0-3 as well as 7 and 8 are used for running of the status mode.

Bit 2: Quickstop:	With the transition from 1 to 0 (Falling Edge) of this Bit, Quickstop results with the corrsponding transition in the status Drive (ref.5.4 “Status Drive“)
Bit 7: Resetting After Fault:	With the transition for 0 to 1 (Rising Edge), all the inverter faults are reset.
Bit 8: Stop:	By resetting of this Bit, motors are commanded to stop with pre-set deceleration (ref: 5. 4 “Status Drive)
Bit 4-6, 9-11, 13	They must not be set. (Reserved or manufacturing specific Bits)
Bit 12:	This allows access to the internal Command Word (Address FAOOH) of the VF S7 inverter (ref. 10.2.2 “Parameters“). This is possibly only in the “Status Drive“ Enabled, state in order to restrict unauthorized start outside this state (0=Access not possible, 1= Access Enabled)
Bit 14 Switching:	Switching of the direction of rotation of the motors with reference command over the Profibus (ref 6.2.2“Speed Reference)
Bit 15 Reference Value Input:	Swiching of the Reference Command fromt either Terminal Strip of VFS7 or the bus.(Bus=0, Terminal Strip=1)

5.3 Profibus Status Word

The Profibus-Status Word is mainly identical to the Drivecmom and CANoen Status Word.Over the Staus Word, the drive regulation responds back it's Operational Status. It is composed of two Bytes together whose 16 Bits have following disposition

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Motor Status Run=1 Stop=0	Directiof Rotation Right=0 Left -1	Not used	Not used	Limit value	Reference value reached	Remote	Not used

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switching Blocked	Quick Stop	Voltage Blocked	Fault	Operation Enabled	Swtiched ON	Ready for Swicth ON

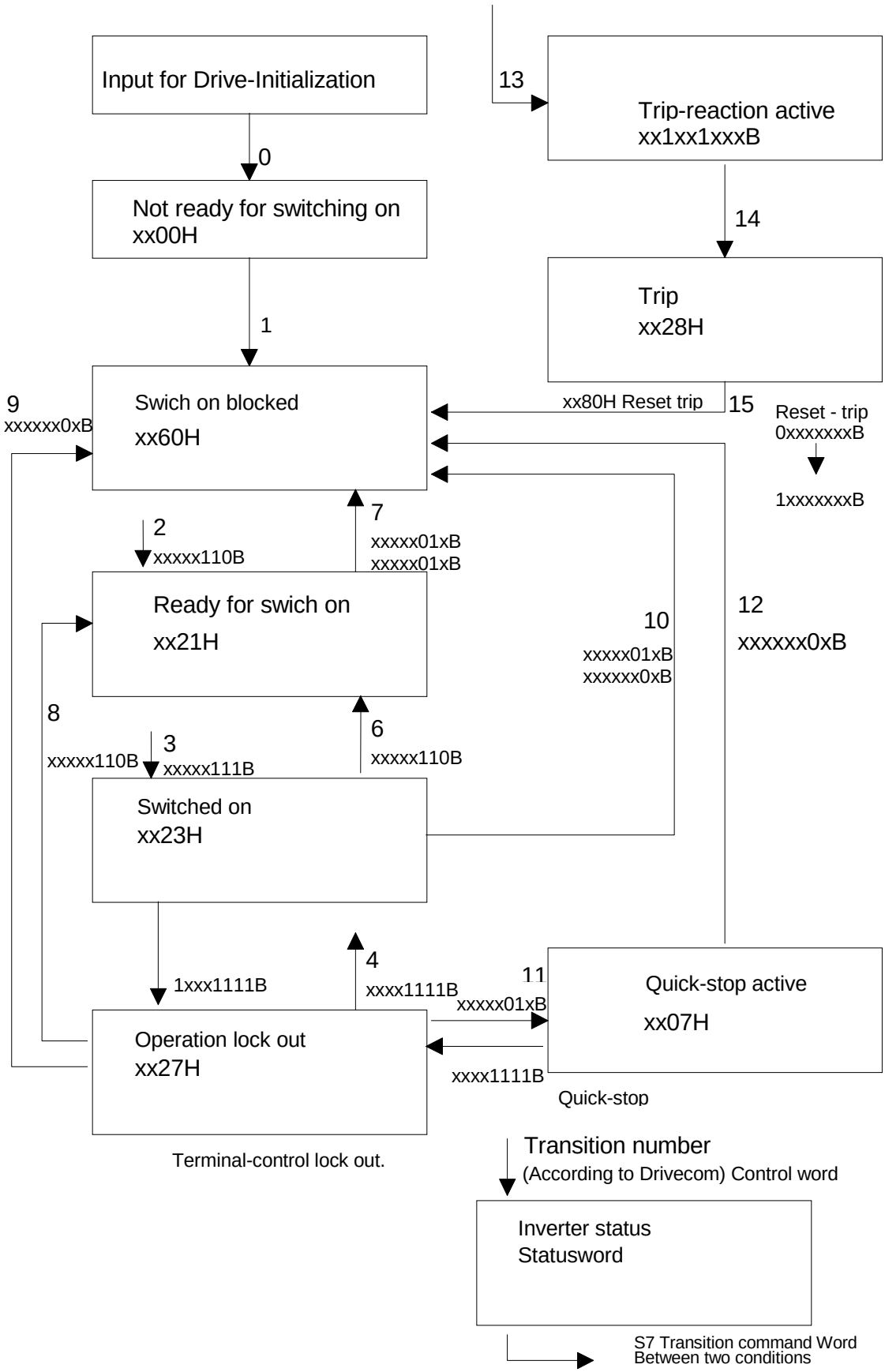
The Bits with Grey backround are pre-set from the Drive profile of the Pofibus DP(Mandatory).

5.3.1 Meaning of the bits in Control Word

Bit 3:fault :	This Bit is set when the corresponding VF S7 comes up wtih a fault.(Transition 13, 14).
Bit 8,12-13 Free:	These Bits msut always be 0.
Bit 9 Remote:	This Bit is set when a functionable communications connection between the Profibus-Modue and the connected inventor is established. The supervision of the Profibus_Systems must be from the Master.
Bit 10 Reference Value Reached :	Bit 10 is set as soon as the motor frequency is smaller or equal to the actual Referance Value (± 2,5 Hz Hysteresis). This Bit 10 is set also of motor is at standsstil (and the Reference Vlaue is zero).
Bit 11 Limit Value:	This Bit is directly influeneced by the setting of speed-limit vlalue (ref :6.2.4 „Speed limit-value (Object 6046H)“)
Bit 14 Direction of Rotation:	Signals direction of Motor Rotation (0:Clockwise, 1: anit-clockwise)

5.4 Bit 15 Motor Status: Run Indication:This Bit is set by either running motoror by active DC current swicthing.

5.4 Drive initialization (TOSHIBA Inverter VF S7, S9, A7, P7, nC1)



6 Profibus Objects

6.1 General

Profibus is basically address oriented. It is possible to change and re-adjust all the parameters and the variables of the connected inverter. These values are always stored in inveter's or Profibus-Module RAM whenever called upon via Objetcs. The procedure is described here very briefly.

The CANopen Profile „Velocity Mode" regulates the control of drives as per the Interbus-S Drivecom-Profiles 20-22. The functions are copied whereby the important functions are copied as Duty Functions (Mandatory). The scope and the order of magnitude are given by Profile "Velocity Mode". The operating profile of the Profibus DP takes over these Objects. It is described as follows:

The Profibus-Module participates as a slave in the communication over Profibus DP. The Bus information and control commands are shared with the Profibus-Module, which it passes on to the connected inverter as control words. On it's side, the Profibus-Module communicates further the feedback (status word) recieved from the inverter to the Bus-Master. The information contained in the Data words 1-8 of the data Strings can be foreseen such as Process Data Channels.

For the use of data words 9-14, the Object Parameters of the connected inveter described hereunder can be addressed and also the supporting functions can be activated, whereby all the parameters and variables of the VF S7 can be read and written. (e.g 9 "Complete Acess of all the Variables of"). It can be seen as utilisation of Parameter data channel

The entire control information and status information must be programmed and managed from the Bus-Master.

Tip!

All objects (60 XXH) foreseen with an index can be addressed over the Data words 9-14. The coding of the plug-in connector (Hence the targeted response of an inveter) is realised in High-Byte from word 9. With the individual objects, the data lengths and units are specified, the words or the double-words are then to be described as appropriate.

6.2 Profibus-Interface, Explanation of Objects

Tip!

The specified values, which lie outside the adjustable limits of the VF S7 inverters can be adjusted at the respective limit values and are correpondingly displayed in the feedback.

By adjusting the values which are not specified over the objects but specified with the help of special functions over the words 9-14, the inverter generates Fault annunciation (e.g 9,3,4 " Reception from Inverter, Faulty communcation ("N"))".

By accesing unknown or undefined objects, no fault is annunciated; in the Reception-DATA- Words 11-14 indicates OOH

Tip!

By establishing the connection of the inverter VF S7 to the Profibus-Module, the actual inveter data is read and accepted as setting it in the module.

6.2.1 Number of Pair of Poles (Object 604DH)

Meaning	Number of Pair of Poles of a motor
Object Nr. in Word 10:	604DH
Data length from Word 11:	1 Byte (Low Byte in Word11)
Vakue Domain:	1 ... 255, pre adjusted on 2 (1 .. FFH) With the setting of 0 as number of pole-pairs, the module interpreters the setting for speeds as bipolar in Hz and assumes no calculation of 1/min in Hz.
Unit:	1

The number of pole-pairs are required in order to calculate rotations (min^{-1}) from the Frequency (Hz). The formula for calculation of speed from frequency is:

$$n = f \times 60 / P$$

Where: n = Motor speed in 1/min

f = Supply frequency in Hz (it is automatically read from VF S7 address 0007H)

p = Number of Poles-Pairs
The permissible range for p is from 1-255. By writing the values as 0, all the speeds are set in Hz.

Tip!

The pole-pairs are preset for commonly found 4-pole motors (p=2), which corresponds to operational speed of 1500 1/min with 50 Hz and 1800 1/min with 60 Hz frequency.

A change in the pole-pairs leads to consideration of other values, when they are accessed next. For example, a change in pole-pairs is first converted into new speed when it is accessed next.

6.2.2 Speed Setting (In Profibus-Data string transmitting word 2,4,6,8)

Meaning	Speed set-point value for the inverter
In Word 2, 4, 6, 8:	
Data Length:	1 Word (2 Byte)
Value Domain:	-32768 - +32768, 15 Bit + Sign (0000H to 7FFFH= positive, 0000H= 0; 7FFFH= 32767) (FFFFH to 8000H= negative, FFFFH= -1; 8000H= -32768)
Unit:	1/min or 0,01Hz (as per the setting of pole-pairs)

Tip!

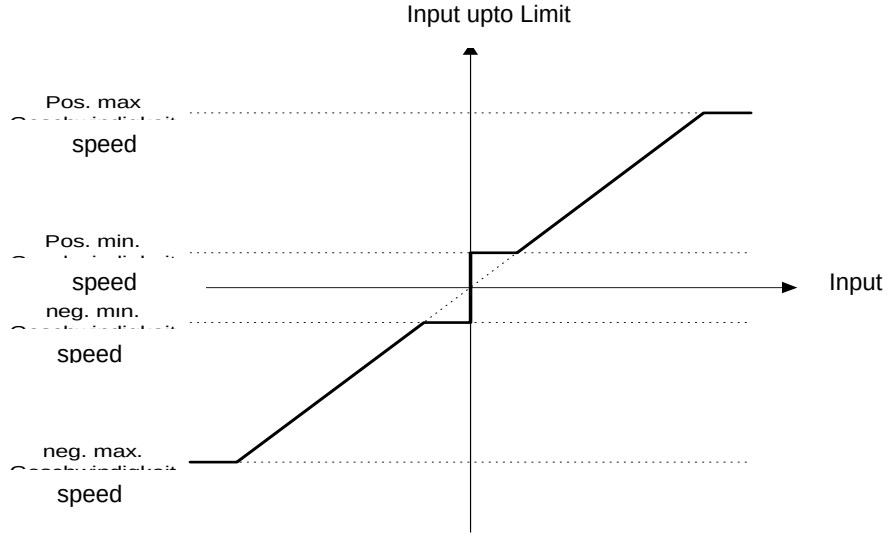
Profibus writes a bipolar Reference value. That means, the setting value contains speed and the direction of rotation. This must also be kept in mind while setting the direction of rotation.

With clockwise directional setting, the positive speed values of a reference correspond to clockwise direction and the negative speed value of a reference correspond to anti-clockwise direction.

With anti-clockwise directional setting, positive speed value of a reference correspond to anti-clockwise direction and negative speed value of a reference corresponds to clockwise direction.

6.2.3 Maximum/Minimum Speed (Object 6056H)

Meaning	Maximum and Minimum speed for the inverter (ref: sketch in part 6.2.4 (”Speed-Limit settings”)
Object Nr. In Word 10:	6056H
Word 11 & 12	Minimum Speed
Word 13 & 14	Maximum Speed
Data Length	Two Double words (total 8 Byte)
Value Domain:	Each Double word 0 - (2^{32}-1)
Unit:	10^{-3} min^{-1} or (with pole-pair setting of 0) o,o1 Hz

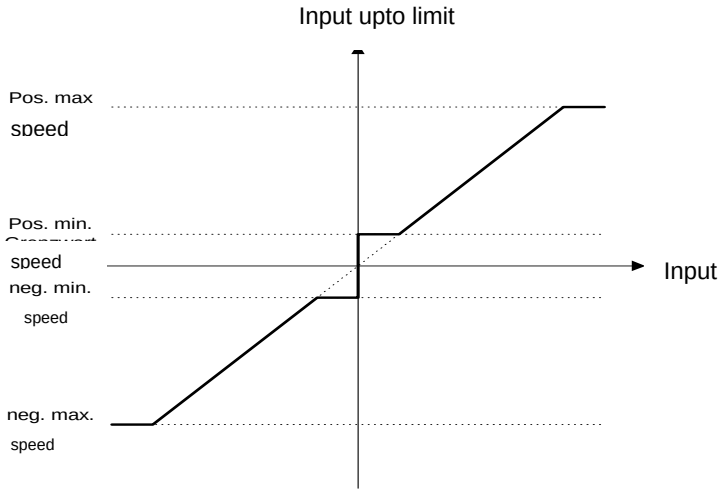


Example for unique setting of 35 1/min as minimum speed and 2,750 1/min as max. speed for the inverter with Address 1 (Occupancy of the Byte for the words 9-14: Byte 1= high-Byte of word 9, Byte 10= Low-Byte of word 9 etc.)

Word 9		Word 10		Word 11		Word 12		Word 13		Word 14	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Byte 12
ID und Üb.-Code		Object Nr.		min. speed (35.000 1/min)				Max..speed (2.750.000 1/min)			
01H	57H	60H	48H	00H	00H	88H	B8H	00H	29H	F6H	30H

6.2.4 Speed-Limit Setting (Object 6046H)

Meaing	Max. and mim. Speed limit value for both the directions
Object-Nr. In Word 10:	6046H
Word 11 & 12	Minimum Limit value
Word 13 & 14	Maximum Limit value
Data Length:	Two Double words (Total8 Bytes)
Value Domain:	0 - (2^{32}-1)
Unit:	10^{-3} min^{-1} or (with pole-pair settingof 0) 0,01Hz



These threshold values are proportional for the setting of Bit 11 (Limit value) in the status word of the respective interests. Here a minimum and maximum limit value is given to a Double-word, which is then valid for both the directions.

Tip!

The Bit 11 in Status Word (ref. 5.3, "Profibus Status Word") is set when the permissible range is over exceeded or under exceeded. The Parameter "LL"(Address 0013) and "UL" (Address 0012) from the inverter are read out as settings und and converted to the corresponding speeds.

6.2.5 Positive Acceleration (Object 6048H)

Meaning	Acceleration, Differential Speed
Profibus-Marking:	*positive Acceleration*
Objekt-Nr. In Word 10:	6048H
Word 11 & 12	Differential Speed
Meaning	pos. Acceleration, Differential Speed
Data Length	1 Double-Word(4 Byte)
Value Domain:	0- (2^{32}-1)
Unit:	min^{-1} or (with pole-pair setting of 0) 0,01Hz
Pre-setting:	Calculated from the VF S7 Parameters
Word 13	*Differential Time*
Meaning	pos. Acceleration, Differential Time
Data Length:	1 Word (2 Byte)
Value Domain:	0...-65535
Unit:	0,1s
Pre-setting::	Calculated from the VF S7 Parameter – ramp-up Time ACC

The effective acceleration results as a quotient of Differential Speed and Diffeential Time. This value is calculated from the Profibus-Module and transmitted to the inverter VF S7. For the selection always the actual inverter values referred to the rated speed are picked and indicated.

6.2.6 Negative Acceleration (Object 6049H)

Meaning	Acceleration, Differential Speed
Profibus-Marking:	*negative* Acceleration
Object-Nr. In Word 10:	6049H [1]
Word 11 & 12	Differential Speed
Meaning	neg. Acceleration, Differential Speed
Data Length:	1 Double-Word (4 Byte)
Value Domain:	0- (2^{32}-1)
Unit:	min^{-1} or in 0,01Hz
Pre-setting:	Calculated from VF S7 Parameters
Word 13	*Differential Time*
Meaning	Acceleration, Differential Time
Data Length:	1 Word (2 Byte)
Value Domain:	0...-65535
Unit:	0,1 s
Pre-setting:	Calculated from VF S7 Parameters Ramp-down Time DEC

The effective Acceleration results as a quotient of Differential Speed and Diffeential Time

Tip!

The parameters of the positive and negative Acceleration remain stored in RAM of the Profibus-Module.It suffices to change a value so that the new acceleration can be determined. Every selection of a value after that requires setting of both the data words.

The differential speed is calculated by the Profibus-Module always based on the rated speed and correspondingly displayed during feedback.

Example: An eight pole motor (four pole-pairs, Rated Speed 750 min^{-1}) is controlled by a VF S7 which is connected to the plug-in connector 1 of the Profibus-Module. The maximum speed of this motor is supposed to be 1500 min^{-1} , and the acceleration time for this speed to be 10 s. The unique writing for it is:

The Profibus-Module receives from Word 9 onwards following data:

Wort 9		Wort 10		Wort 11		Wort 12		Wort 13	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID and Üb.-Code		Object-Nr.		Pos. Differential Speed				Differential Time	
01H	57H	60H	48H	00H	00H	05H	DCH	00H	0AH

Hint: The Acceleration Time ACC of the VF S7 is with reference to the supply frequency (Adress 0007). (Under the assumption that in „0007“ ,50Hz is entered), the Profibus-Module sends for this acceleration (0 to 100 Hz in 10 s) the value of 5 sec for the parameter ACC of the VF S7.

Note: The requirement for the motor to be driven at 1500 min^{-1}, is that the Object 6058H (Maximum/Minimum speed for the inverter at plug-in connector 1) is also correspondingly adjusted.

7 Application of Profibus with TOSHIBA VF S7

7.1 Construction of the Profibus DP Data Transmission

Word Nr	Meaning
1	Control Word and Status Word for the inverter at plug-in connector 0
2	Speed –Reference and Actual Value the inverter at plug-in connector 0
3	Control Word and Status Word for the inverter at plug-in connector 1
4	Speed –Reference and Actual Value the inverter at plug-in connector 1
5	Control Word and Status Word for the inverter at plug-in connector 2
6	Speed –Reference and Actual Value the inverter at plug-in connector 2
7	Control Word and Status Word for the inverter at plug-in connector 3
8	Speed –Reference and Actual Value the inverter at plug-in connector 3
9- 14	Reading and Writing of parameters of VF S7 (5 Words)

As on the Profibus-Module up to four Vf S7 series inverters can be connected, there are also four separate Control Words and Status Words as well as four separate reference values and actual values for individual inverters.

Further, it is possible to read and write all the parameters of the connected inverter VF S7, via the words 9 – 14 (Ref. **Fehler! Verweisquelle konnte nicht gefunden werden.** Complete Access to all the variables of)

Construction of the Words 9- 14:

Word-Nr.	Contents
9	High-Value Byte (Byte 1): Plug-in Connector of the VF S7 on the Profibus-Modul and the method of evaluation Lower Half Byte : Address (0-3) Upper Halfbyte: Method of evaluation (0-singular, 8-Cyclical) Low-Value Byte (Byte 2): Order Type “R” = Read Data (52H) “W” = RAM-Write Data (57H) “P” = EEPROM-Write Data (50H)
10	Object-Number or Parameter-Address in Inverter (see 10 “Address list of the VF S7”)
11 - 14	With Write Command: Data

All other values are given by the objects defined by each Bus-participants.

7.2 Pre-settings

The Profibus-Module has a pre-setting which is shared over GSD-Data of the Profibus-Master. The adjustment decides 2 communications channels per Bus-participants : Two Sending Words and Two Receiving Words per inverter plug-in connector, as well as five Sending Words and Receiving Words which can be used alternately for all the inverters connected to the Module.

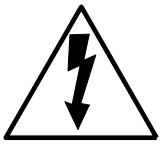
Commissioning

7.3 Switching ON

1. Prepare and load the Bus configuration with the help of GSD-Data. The GSD-Data for the Profibus-Modul TOS - VF - PB is supplied on the diskette with Module.
2. For the setting of undervoltage, set correct addresses on the Profibus-Modul with rotary switches 1 and 2. Profibus-Module recognises the transmission rate (max. up to 12 MBit/s) internally.
3. Connect the inverter VF S7 with the Profibus-Module.
4. Supply Auxiliary voltage to the Profibus-Module.
5. Start the Profibus.
6. With the connection, VF S7 automatically monitors it's communication to the Profibus-Module. Start of a motor is only possible when the Statusdrive can run . (ref. **Fehler! Verweisquelle konnte nicht gefunden werden.** "Statusdrive").
7. Set parameters for the inverter as per the application (Pole-pairs, maximum and minimum Speed, Limit Values as well as negative and positive Acceleration).
8. Start the inverter as per the application.
   Hint: All the settings in the Profibus-Module are stored only in the RAM of the module.
9. Reset the faults on the inverter basically over the Profibus.

7.4 Hints for Commissioning / Operation

Warning!



Always have the 24 V supply for the Profibus-Module.

By not having this voltage on the Profibus-Module while starting of the inverter, the terminals of the inverter are enabled as per the circuit connection of digital / analogue inputs and the motor can start running.

If the 24 V voltage is interrupted, the inverter goes in to control stop mode with Fault annunciation "ErrS".

Tip!

If processing of a fault is set by the Master, The Profibus-Module ensures that, with interruption of the buses, the inverter goes into controlled stop mode with fault „ ErrS". For re-starting, this fault must be be reset over Profibus.

Tip!

Faults should be reset over the Bus. Nevertheless, it is possible to reset a fault also by switching off and on the power supply of the inverter. In this case it is ensured further, that the starting of the inverter can take place only over the Profibus.

Tip!

The Profibus-Modul ensures that with the connection of an VF S7 inverter with the Profibus-Module Bus connection is established automatically. The inverter announces the status word "Remote" (Bit 9 = 1).

Tip!

The Profibus-Module ensures that the inverter VF S7 does not start running by itself immediately after the connection to the Profibus-Module. The Local operation via the terminal strip is blocked and it is enabled only when the Statusdrive runs up to the state „ Operation Enabled“ and the Bits 14 and 15 are reset in the respective control words.

Tip!

The connection between the Profibus-Module and one or more inverters can be broken without any effect for the Profibus-Module or for the remaining inverters. In Status Word of the afftected inverter, the annunciation „Remote“ (Bit 9) is set to 0 and the inverter goes into control stop mode with fault „ErrS“.

Tip!

Write and Read commands of an inverter that is not connected, does not influence the functions of the other connected inverters. In this case, response <N> (Communication Failure) results.

Caution!

The inverter is set for control over the Profibus. With this, the motor runs up when via the Profibus-Module the status “Operation Enabled” is reached in the Statusdrive, a Run-command is given at the terminal strip , the inverter is programmed for the terminal strip operation and the reference value is given over the Profibus. For the Run-command to be from the Profibus, it can be set in Profibus-Control Word of the inverter.

Tip!

All Parameters of the VF S7 can be displayed on the integrated operator terminal.

The display of a parameter on the integrated slave terminal of VF S7 is not automatically refreshed with the changes. To actualise the display, keep switching between the double-push on the DATA-button on the display of the parameter code and renewed numerical value.

Tip!

If nothing else is adjusted, all adjustments and settings are stored in the RAM of the inverter.

Many SPS- und PC- control systems exchange a series of High-Bytes and Low-Bytes during Word Transfer command. In such cases, High and Low Bytes can be exchanged, which should be kept in mind during programming.

7.5 Incompatibility of Functions

The following functions cannot be configured simultaneously. By losing the compatibility, the inverter sends back the fault message described in chapter 8 ("Complete Access of all Variables of")

	Summing Reference-Value	PI-Control	JOG	Frequency Selection
Summing Reference-Value		●		
PI-Control	●		●	●
JOG		●		
Frequency Selection		●		

•: Incompatible Functions

8 Complete Access To All Variables of TOSHIBA VF S7

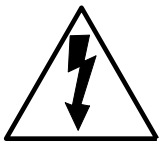
To supplement the aforesaid description of Profibus-Objects on all variables and parameters of the inverter for aceess, Read and Write instructions can be undertaken over the words 9 –14 of the Profibus Telegram. Thus, the Profibus-Module takes over the control and standard data and reduces the required Data Protocol to it's basic utility data. This is possible by setting of Bits in the control word as per manufacturer's specification.

Command Type, COM

COM [1 Byte]		**DATA [1~4 Bytes] (Hexadecimal Range)**
Command/ Hex/ Binary Value	Meaning	
<R>:(52H) / 0101 0010 :	Command Type –Read Data	No Data
<W>:(57H) / *0101 0111:*	Command Type RAM –Write Data	Write Data (*0H - FFFFH*)
<P>:(50H)/ 0101 0000:	Command Type EEPROM- Write Data	Write Data (*0H - FFFFH*)

General Example:

Warning!



With the setting of the Bit 15 in Word 9, transition between singular and cyclical Information takes place. A combination of cyclical Write operation with with EEPROM-Write –Data is not recommneded and can lead to destruction of EEPROM as a result of violation of the permissible Write cycles.

Tip!

In the following examples, examples are mentioned such as to how to access the extended functions in VF S7 via Words 9 – 14.: For this, in Byte 1 of Word 9, connection point of the respective VF S7 on the Profibus Module must be given, otherwise the Profibus-Module always accesses the 0 connection point.

Tip!

The response of the FU via the Profibus-Module with this form of instructions (over internal FU-Addresses) is maximum 1 Word (2 Bytes) long. The normal Receiver-DATA_Words (Words 12-14) are not over-written and hence can still have Data contents of the previous instructions.

General Example:

Defined Message from Profibus Receiver, singular (write command: "P" or "W")

Byte 1	Byte 2	Byte 3 | Byte 4	Byte 5 | Byte 6
VF S7 - Nr.	COM	Logic address	Data
0 | 00000 | x | x	xxxxxxxx	xxxxxxxxxxxxxxxx	xxxxxxxxxxxxxxxx
00H for Nr. 0	"W"	16 Bit binary	16 Bit binary
01H for Nr. 1	"P"	0000H - FFFFH	0000H - FFFFH
02H for Nr. 2		Byte 4:MSB, Byte 3: LSB	Byte 6:MSB, Byte 5: LSB
03H for Nr. 3			

Defined Message from Profibus Receiver, cyclical (write command: “P” or “W”)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
VF S7 - Nr.	COM	Logic address		Data	
1 |00000| x | x	xxxxxxxx	xxxxxxxxxxxxxxxx		xxxxxxxxxxxxxxxx	
80H for Nr. 0	“W”	16 Bit binary		16 Bit binary	
81H for Nr. 1	“P”	0000H - FFFFH		0000H - FFFFH	
82H for Nr. 2		Byte 4:MSB, Byte 3: LSB		Byte 6:MSB, Byte 5: LSB	
83H for Nr. 3					

Defined Message from Profibus Receiver, singular (Read Command: “R”)

7 ..... 0 7 ..... 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4
VF S7 - Nr.	COM	Address	
0 |00000| x | x	xxxxxxxx	xxxxxxxxxxxxxxxx	
00H for Nr. 0	“R”	16 Bit binary	
01H for Nr. 1		0000H - FFFFH	
02H for Nr. 2		Byte 4: MSB, Byte 3: LSB	
03H for Nr. 3			

Defined Message from Profibus Receiver, cyclical (Read Command: “R”)

7 ..... 0 7 ..... 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4
VF S7 - Nr.	COM	Address	
1 |00000| x | x	xxxxxxxx	xxxxxxxxxxxxxxxx	
80H for Nr. 0	“R”	16 Bit binary	
81H for Nr. 1		0000H - FFFFH	
82H for Nr. 2		Byte 4: MSB, Byte 3: LSB	
83H for Nr. 3			

Response on Write/ Read Commands

Defined Message on the Profibus singular sending

Normal Answer

7 ..... 0 7 ..... 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
VF S7 - Nr.	COM	Logic address		Data	
0 |00000| x | x	xxxxxxxx	xxxxxxxxxxxxxxxx		xxxxxxxxxxxxxxxx	
00H for Nr. 0	“R” or “r”	16 Bit binary		16 Bit binary	
01H for Nr. 1	“W” or “w”	0000H - FFFFH		0000H - FFFFH	
02H for Nr. 2	“P” or “p”	Byte 3: MSB, Byte 4: LSB		Byte 5: MSB, Byte 6: LSB	
03H for Nr. 3					

Defined Message on the Profibus cyclical sending

Normal Answer

7 ..... 0 7 ..... 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
VF S7 - Nr.	COM	Logic address		Data	
1 | 00000 | x | x	xxxxxxxx	xxxxxxxxxxxxxxxx		xxxxxxxxxxxxxxxx	
80H for Nr. 0	“R” or “r”	16 Bit binary		16 Bit binary	
81H for Nr. 1	“W” or “w”	0000H - FFFFH		0000H - FFFFH	
82H for Nr. 2	“P” or “p”	Byte 3: MSB, Byte 4: LSB		Byte 5: MSB, Byte 6: LSB	
83H for Nr. 3					

Answer on a false Message Cyclical :

7 ..... 0 7 ..... 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4
VF S7 - Nr.	COM	Address	
1 | 00000 | x | x	xxxxxxxx	xxxxxxxxxxxxxxxx	
80H for Nr. 0	“N” or “n”	16 Bit binary	
81H for Nr. 1		0000H - FFFFH	
82H for Nr. 2		Byte 3: MSB, Byte 4: LSB	
83H for Nr. 3			

8.1 Status Annunciation COM

COM [1 Byte]	**DATA)**		
Status/ Meaning	Hex	Binary value	Data Range
<*N*>: Communication Fault Inverter Status Readable, Inverter is not in the Fault Status (e.g. Very high value is given)	*(4EH)*	0100 1110	
<*n*>: Communication Fault Inverter Status Readable, Inverter is in the Fault Status	(*6EH*)	0110 1110	
<*P*>: EEPROM-Data writing successful	*(50H)*	0101 0000	
<*p*>: EEPROM-Data writing not possible	*(70H)*	0111 0000	
<*R*>: Data reading successful	(*52H)*	0101 0010	(*0H - FFFFH*)
<*r*>: Data reading not possible	*(72H)*	0111 0010	
<*W*>: RAM - Data writing successful	*(57H)*	0101 0111	(*0H - FFFFH*)
<*w*>: RAM- Data writing not possible	*(77H)*	0111 0111	

8.2 Examples

8.2.1 Read Command on inverter TOSHIBA VF S7 ("R")

For making up the examples, the Addresses and the Valuations of the variables of the address list of the VF S7 inverters are used as basis. Byte 1 is the higher value Byte of Word 9, Byte 2 the lower value and so on.

DC Link Voltage of the inverter at the connection point 3 cyclically reads out as:

7 ..... 0 7 ..... 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4
VF S7 - Nr. 3	COM "R"	Address	
1 | 0000 | 1 | 1	0101 0010x	1111 1110 0000 0100	
83H	52H	FE04H	

Ramp-up time of the inverter at connection point 2 singularly reads out as:

7 ..... 0 7 ..... 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4
VF S7 - Nr. 2	COM "R"	Address	
0 | 0000 | 1 | 0	0101 0010x	0000 0000 0000 1001	
02H	52H	0009H	

8.2.2 Writing in RAM Memory of the inverter TOSHIBA VF S7 ("W")

Tip!

In order to accept the given reference value over the Profibus with words 9 – 14, the Bit 15 of the Profibus Control words must be set.

30 Hz Reference Value for the inverter at connection point 1 singular sending

7 ..... 0 7 ..... 0 7 .... . 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
VF S7 - Nr. 1	COM "W"	Adresse		Daten	
				30Hz/ 0,01= 3000	
0 |00000| 0 | 1	0101 0111	1111 1010 0000 0001		0000 1011 1011 1000	
01H	57H	FA01H		0BB8H	

50 s Ramp-up Time for the inverter at connection point 1 singular sending.

7 ..... 0 7 ..... 0 7 .... . 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
VF S7 - Nr. 1	COM "W"	Address		Data	
				50s / 0,1= 500	
0 |00000| 0 | 1	0101 0111	0000 0000 0000 1001		0000 0001 1111 0100	
01H	57H	0009H		01F4H	

8.2.3 Reception From Inverter, Communication OK ("R")

Motor-Actual Frequency (30 Hz) from inverter at connection point 2 cyclically reads out as:

7 ..... 0 7 ..... 0 7 .... . 0 7 0

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
VF S7 - Nr. 2	COM “R”	Address		Data	
				3000 x 0,01= 30s	
1 | 00000 | 1 | 0	0101 0010	1111 1110	0000 0000	0000 1011	1011 1000
82H	52H	FE00H		0BB8H	

8.2.4 Reception From Inverter, Faulty Communication ("N")

Response to given Reference Value at inverter 2 , Reference Value above that of UL

7 ..... 0 7 ..... 0 7 0

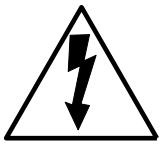
Byte 1	Byte 2	Byte 3	Byte 4
VF S7 - Nr. 2	COM “N”	Address	
1 | 0000 | 1 | 0	0101 0010x	1111 1010	0000 0001
82H	4EH	FA01H	

8.2.5 Configuration of the VF S7 with the Profibus-Module

The time monitoring of VF S7 is switched off at the factory. (VF S7 Parameter 0803H). In order to switch off the drive under broken connection to the Profibus-Module, set a value of >0 on this parameter.

If the operator of the drive prefers not to switch off in such cases, one of the measures for him is to set the Parameter 0803H on 0 so as to switch off the time monitoring.

Warning!



If the Time monitoring – so called Watchdog- of the inverter remains switched off, there exists the danger of undesirable start of the motors connected to the inverter.

Tip!

The transmission rate adjusted in the inverter must remain at 9600 Bit/s so that the Profibus-Module can establish the communication with the inverter

When the Profibus-Module receives no answer from the drive, the Profibus-Module sends back the Code 18H (“errS”) to the Master, if the user defined query is a Read Command at the address FC90H (Fault Register). After more unsuccessful Read attempts between the Profibus-Module and the Vf S7, the Profibus-Module sets the VF S7 in „Start Block“ status in order to avoid automatic new Start of the Vf S7 inverter if communications connections is re-established.

9 List of Addresses of TOSHIBA VF S7

9.1 Headings in the Parameter list

Address HEX	The four-tier number for the identification of the parameters is given as Hexadecimal values. In the binary mode, the Address is sent in the form of 2 Bytes with the higher valued Byte first and the lower valued Byte at the end, whereby the given Hexadecimal values are converted in Binary values.
Display FU	The sign that comes on the 7-segment LED display of the VF S7 Inverter.
Parameter Description	Description of the parameters
Range of Adjustments	Maximum and Minimum values permissible from VF-S7. Division by the multiplier gives the Word value to be sent
Resolution	Scale factor with unit. Multiplication with the raw data gives the actual value. After division of the actual values by the scale factor results the corresponding raw data. Some parameters are not scaled. One can select from many setting possibiites.
Access	Read-Parameter can only be read. Stop- Parameter can be written only with VF S7 in Stop mode (= Motor at stand-still) Always-Parameter can be read and written at any time.

9.2 Parameter list

The parameter set of the S7 frequency converter consists of in all 91 different parameters which are theme-wise bound together in the 9 parameter groups and a user-parameter group. The dial-up and the changing of the parameters in general is described in chapter 6 .

In the following, various parameter groups are introduced and explained.

BASIC PARAMETER #1: This group contains all the parameters which are important for the basic settings of an inverter. (e.g. . Ramp settings, Method of control, electrical data of supply and motor).

TERMINAL FUNCTIONS: In this group, the input and the output terminals can be programmed individually.

(Parameter F100 **to** F132 **)**

FREQUENCY PARAMETER: This group contains the parameters for setting reference value and characteristics of the inverters in special situations.

(Parameter F200 **to** F294 **)** (e.g. DC Braking, Jump Frequency)

SPECIAL FUNCTIONS: Parameters that decide the characteristics of the inverter in fault conditions, internal adjustments (carrier frequency) and auxiliary circuit for the inverters (Braking Resistance) .

(Parameter F300 **to** F363 **)**

MOTOR PARAMETES: The parameters of this group are self-set by the so called Auto-tunning-run of the inverter and contain information on the connected motor and the drive. As a rule, these parameters should not be changed.

(Parameter F400 **to** F405 **)**

BASIC PARAMETER #2: **(Parameter** F500 **to** F505 **)**	The parameters of this group offer second Ramp-up and ramp-down Besides, further settings for ramp-up and Ramp-down are selectable.
PROTECTIVE FUNCTIONS: **(Parameter** F600 **to** F618 **)**	This group, protective functions such as emergency stop, Overload, and fault processing are set.
DISPLAY PARAMETERS **(Parameter** F700 **to** F702 **)**	These parameters decide the display of Current, Voltage, frequency , or frequency proportional values.
COMMUNICATION: **(Parameter** F800 **to** F803 **)**	In this parameter group, the settings for the integral interface are contained (e.g.. Baud rate, Parity).
USER PARAMETER: **(Gruppe** Gr.U **)**	This group contains all the parameters which deviate from the factory settings. With this, finding of the modified parameters is quick and uncomplicated.

9.2.1 Standard parameters

On the basis of this parameter list it is explained how over the Profibus the parameters can be accessed.

For each parameter following information is given:

- Addresse, to be given in the message on the VF S7,
- Parameter display on the operator panel,
- Upper and Lower limit values,
- Internal scale factor (Multiplier) or List of the available options.
- Method of accessing each parameter.

For the parameters with the internal scale factors, the data in the transmitted message is scaled with the multiplication factor.

Example:

Setting of the Ramp-up (ACC) at 415,8 Sec. The scale factor of ACC parameter is 0,1 Sec.

The Data value in the message sent is 415,8 / 0,1 = 4158 = *103EH*.

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0000	AU1	Setting of the Ramp-up and ramp-down	0: manual 1: automatic	-	always
0001	AU2	Selection of the Method of Operation / Torque Control of the inverter At the dial-up, the parameter always remains on the setting of 0	0: Manual Setting 1: automatic voltage boost (corresp. Pt = 2) 2: Vector Control (SLV) (corresp. Pt = 3) 3: SLV withAuto-Tuning (corresp. F400 = 2 and Pt = 3)	-	In Stop
0002	AU3	Setting of Operational Characteristics This parameter changes at values of 1 or 2 the following parameter contents:: type Setting of Motor rated Frequency FH, UL, uL, F204, F213 (s. page 7.7) F301 Activation of Motor Capture function F302 Ride-over of supply failure. F307 Output Voltage compensation On F502 Ramp-up-/Braking form	0: Manual Setting 1: type = 1 (50Hz) F301 = 1 F302 = 1 F307 = 1 F502 = 1 2: type = 2 (60Hz) F301 = 1 F302 = 1 F307 = 1 F502 = 1	-	In Stop
0003	CMOD	Command over	0: terminal Block 1: Push Buttons	-	Always
0004	FMOD	Frequency Set-point over	0: terminal Block 1: Push Buttons 2: Potentiometer Button	-	Always
0005	FMSL	Finalising the magnitude for the FM Terminal	0: Output Frequency 1:Output Current 2**: Freq. Set-point at FM, Level adjustable with arrow button , offline, 3**: FU-rated Current at FM, Level adjustable offline,	-	Always
0006	FM	Caliberation function for the FM-Terminal: With connected measuring equipment thi cn be equalized Online to the selected value under parameter FMSL.	(see Section 7.3.3)	-	Always
0007	tyP	Selection of the Basic Setting FH, uL, UL, F204, F213 (See Page 7-7)	1: 50Hz-setting 2: 60Hz- setting 3: Factory setting (Caution: With Factory setting FH, UL, F204, F213 on 80 Hz and uL on 60 Hz set).	-	In Stop
0008	Fr	Selection of the Direction	0: Forward 1: backward	-	Always
0009	ACC	Ramp-up time #1 The ramp-up time is measured from the standstill up to the maximum frequency FH run up.	0,1s ... 3600s	0,1s	Always
0010	DEC	Ramp-down Time #1 The ramp-down time is measured for deceleration from Maximum frequency FH up to still stand	0,1s ... 3600s	0,1s	Always
0011	FH	Maximum Output Frequency	30,0Hz ... 320,0Hz	0,1Hz	In Stop
0012	UL	Upper Frequency Limit	0,5Hz ... FH	0,1Hz	Always

*** above Version 121*

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0013	LL	Lower Frequency Limit	0,0Hz ... UL	0,1Hz	Always
0014	uL	Base Frequency At this frequency the full output voltage is reached. (= Rated freq. Of the connected motor)	25,0Hz ... 320,0Hz	0,1Hz	Always
0015	Pt	V/f-curve selection	0: Linear V/f-Characteristics (Constant Torque) 1: quadratic V/f-Characteristics (variable torque) 2: Automatic Voltage Boost 3: Vector control 4: Automatic Voltage Boost With energy saving function* (ECN-Mode)	-	Bei Halt
0016	ub	Value at „Voltage Boost“, only correct when under Pt a value of 0 or 1 is given	0,0% ... 30,0%	0,1%	Always
0017	OLM	Finalization about the connected motor	Self-cooled Motors: 0: Motor Monitoring active, no “Soft-Stall“-control 1: Motor Monitoring active, „Soft-Stall“-control active 2: No Motor Monitoring active, no „Soft-Stall“-control 3: No Motor Monitoring active, „Soft-Stall“-control active Force-cooled Motor: 4: Motor Monitoring active, no „Soft-Stall“-control 5 Motor Monitoring active, „Soft-Stall“-control active 6: No Motor Monitoring active, no „Soft-Stall“-control 7 No Motor Monitoring active, „Soft-Stall“-control active	-	Always
0018	Sr1	Fixed Frequency Nr. 1	LL ... UL	0,1Hz	Always
0019	Sr2	Fixed Frequency Nr 2	LL ... UL	0,1Hz	Always
0020	Sr3	Fixed Frequency Nr. 3	LL ... UL	0,1Hz	Always
0021	Sr4	Fixed Frequency Nr. 4	LL ... UL	0,1Hz	Always
0022	Sr5	Fixed Frequency Nr. 5	LL ... UL	0,1Hz	Always
0023	Sr6	Fixed Frequency Nr. 6	LL ... UL	0,1Hz	Always
0024	Sr7	Fixed Frequency Nr. 7	LL ... UL	0,1Hz	Always

9.2.2 Extended Parameters

The parameters *0800H* and *0801H* can be written any time, but the modified values are accepted only after the initialisation (after the switch-on).

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0100	F100	Above this Output freq. „SPEED REACH“ is annunciated on the output terminal.	0,0Hz ... UL	0,1Hz	Always
0101	F101	Combined with the Parameter F102 this middle freq. builds the freq. Range for the annunciation at the output terminal.	0,0Hz ... UL	0,1Hz	Always
0102	F102	Freq. Deviation around the Parameter F101. Within this freq. range a signal appears at the corresponding output terminal.	0,0Hz ... UL	0,1Hz	Always
0103	F103	Signal selection for the ST-Function (The ST-Function can be programmed at one of the input terminals . See also Parameter F110 to F115) If the reference value Enable is explicitly programmed (F103 = 0), one of the digital input terminals must be set for ST-Function.	0: Reference Value Enable with connection ST-P24 1: Reference Value Enable Continuously active 2: Tie up with Directional input (Function F or R)	-	Always
0104	F104	Signal selection for the RST-Function (The RST-Function can be programmed at one of the input terminals . See also Parameter F113.)	0: Fault Reset („RESET“) with connection RST- P24 1: Fault Reset („RESET“) by opening the connection RST- P24	-	Always
0110	F110	Determination of a function which is continuously set as active. (Example: Often an explicit reference value is not necessary. In this case this parameter can be set, for example, at 1 in order to hold the reference value enabling continuously active.	(See table below)	0 ... 37	Always
0111	F111	Fixing of function for input terminal F	(See table below)	0 ... 37	Always
0112	F112	Fixing of function for input terminal R	(See table below)	0 ... 37	Always
0113	F113	Fixing of function for input terminal RST	(See table below)	0 ... 37	Always
0114	F114	Fixing of function for input terminal S1	(See table below)	0 ... 37	Always
0115	F115	Fixing of function for input terminal S2	(See table below)	0 ... 37	Always

Option Selection for the Parameter F110 **to** F115 **:**

Value	Function	Value	Functional Combination
0	**No Function**	**23**	**R + S1**
1	**Reference Value Enable (ST)**	**24**	**F + S2**
2	**Forward Run (F)**	**25**	**R + S2**
3	**Reverse Run (R)**	**26**	**F + S3**
4	**Intermittant Operation(JOG)**	**27**	**R + S3**
5	**Switching to Ramp-up and Ramp-down # 2 (AD2)**	**28**	**F + S4**
		29	**R + S4**
6	**Fixed Frequency Selection (S1)**	**30**	**F + AD2 + S1**
7	**Fixed Frequency Selection (S2)**	**31**	**R + AD2 + S1**
8	**Fixed Frequency Selection (S3)**	**32**	**F + AD2 + S2**
9	**Fixed Frequency Selection (S4)**	**33**	**R + AD2 + S2**
10	**Fault Reset (RST)**	**34**	**F + AD2 + S3**
11	**Emergency Stop / External Fault (EMG)**	**35**	**R + AD2 + S3**
12	**Switching between Push Buttons and Terminal control (PNL/TB)**	**36**	**F + AD2 + S4**
		37	**R + AD2 + S4**
13	**DC Braking allowed /Blocked (DB)**	**38****	**It switches from VIA / II to VIB**
14	**PI – Control out of action**		**Caution:** F200 **must stay on „2“.**
15	**Parameter changes allowed (PWREN)**	**39****	**Motor Overload Characteristics #2 and Boost #2**
	(For this earlier in F700 a „1“		
	(= Ssoftware Block) must be programmed	**40****	**(programmed in** F173, F172**) effective.**
16	**ST + RST**		**Motor Overload Characteristics #2 and Boost #2(programmiert in** F173, F172**) + AD2**
17	**ST + PNL/TB**		
18	**F + JOG**		
19	**R + JOG**	**41****	**Motorised Potentiometer run up to FH**
20	**F + AD2 AD2=Acc/Dec. on #2**	**42****	**Motorised Potentiometer run down to LL**
21	**R + AD2 Values for AD2 are set in**	**43****	**Motorised Potentiometer quickstop till LL**
22	**F + S1** F500**,** F501	**44****	**Motorised Potentiometer quickstart and Reset (Reset is effective only in fault condition, the quick stop is not active in fault case.**

***only after V.121*

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0130	F130	Fixing of function for Output terminal OUT1 The output is switched throught when the selected setting from the table below is encountered (see the chapter 3.3.2 also)	(See table below)	-	Always
0131	F131	Fixing of function for Output terminal OUT2 The output is switched throught when the selected setting from the table below is encountered (see the chapter 3.3.2 also)	(See table below)	-	Always
0132	F132	Fixing of function for Output – Relay FLA, FLB, FLC The output is switched throught when either a fault occurs or the selected setting from the table below is encountered (see the chapter 3.3.2 also)	(See table below)	-	Always

Option Selection for the Parameter F130, F131 **and** F132 **:**

Value	Function
0	By reaching / exceeding the Lower Frequency Limit LL
1	By Output frequency under the Lower Frequency Limit LL (Function 0 inverted)
2	By reaching the Upper Frequency Limit UL
3	By Output frequency under the Upperr Frequency Limit UL (Function 2 inverted)
4	By exceeding a Frequency Limit (see Parameter F100)
5	By remaining lower than a Frequency Limit (see Parameter F100 , Function 4 inverted)
6	By completing a ramp-up or Ramp-down process (Other than reaching 0 Hz)
7	During a ramp-up or Ramp-down process and at stand-still (Function 6 inverted), depending on Parameter F102
8	By reaching a frequency range (see Parameter F101 and F102)
9	When the output frequency lies outside the range determined by Parameter F101 and F102 (Function 8 inverted)
10**	Signal in case of Fault
11**	Signal, when no Fault occurs (Function 10 inverted).
12**	Signal at exceeding the over current limit (see F616 and F618)
13**	Signal, when no overcurrent is detected (Function 12 inverted).

***Only above V.121*

All the terminals (F130, F131, F132) can be parametered with the same functional value.

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0172	F172**	Manual Voltage Boost #2	0.0 ... 25.0	0.1%	Always
0173	F173**	Charcteristics Motor Load for FU – Rated Load #2	10 ... 100 (%)	1 %	Always

*** Only above V.121*

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0200	F200	Priority Arrangement for the individual reference value inputs.	0: VIA / II 1: VIB 2**: Selection for digital Input terminals between VIA / II and VIB 3**: Motorised Potentiometer 4**: Motorised Potentiometer with the memory of the last reference value. After the power supply interruption, this lat reference value is actual.	-	Always
0201	F201	VIA- or. II-Input: Reference Value #1	0 ... 100%	1%	Always
0202	F202	VIA- or. II-Input: Freference Frequency #1 assigned to Reference Value #1 (Parameter F201)	0,0Hz ... 320,0Hz	0,1Hz	Always
0203	F203	VIA- or. II-Input: Reference Value #2	0 ... 100%	1%	Always
0204	F204	VIA- or. II-Input: Freference Frequency #2 assigned to Reference Value #2 (Parameter F203)	0,0Hz ... 320,0Hz	0,1Hz	Always

0210	F210	VIB- Reference Value #1 at F200 = 0, 1, 2 **Motorised Potentiometer Reaction Time for ramp-up at F200 = 3, 4	0 ... 100% 0 ... 100s (1=0,1s)	1% 1=0,1s	Always

0211	F211	VIB- Reference Freq. #1 at F200 = 0, 1, 2 **Motorised Pot. Step width for Ramp-up at F200 = 3, 4	0,0Hz ... 320,0Hz 0,0Hz ... 320,0Hz	0,1Hz 0,1Hz	Always Always
0212	F212	VIB- Reference Value #2 at F200 = 0, 1, 2	0 ... 100%	1%	Always
		** Motorised Potentiometer Reaction Time for ramp-down at F200 = 3, 4	0 ... 100s (1=0,1s)	1=0,1s	Always
0213	F213	VIB – - Reference Frequency #2 bei F200 = 0, 1, 2	0,0Hz ... 320,0Hz	0,1Hz	Always
		** Motorised Pot. Step width for Ramp-down at F200 = 3, 4	0,0Hz ... 320,0Hz	0,1Hz	Always
0240	F240	Start frequency: In contrast to the lower limit frquency (Parameter LL), by application of Start Freq. , immediately this frquency is output, whereby during the acceleration up to the lower frequency limit, all the lower frequencies within the domain of ramp-up are also output.	0,5Hz ... 10,0Hz	0,1Hz	Always
0241	F241	Middle Hysteresis Frequency (Parameter F242)	0,0Hz ... FH	0,1Hz	Always
0242	F242	Half Hysteresis Width : With the parameters F241 und F242, programming of run-up hysteresis is possible. The ramp-up starts with a frequency which is given by the summation of Parameter F241 and F242 , the ramp-down process ends with a frequency given by the diference of the Parameter F241 and F242. This function is especially usefull for heavy run-up applications.	0,0Hz ... FH	0,1Hz	Always
0250	F250	Frequency limit for DC Braking The DC Braking is sensible applied only at small frequencies. This parameter decides under which frequency limit, the DC Braking will be activated.	0,0Hz ... FH	0,1Hz	Always
0251	F251	Braking DC Current (Referenced to the value of rated output current)	0 ... 100%	1%	Always

*****Only above V.121***

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0252	F252	DC Braking Time	0,0s ... 20,0s	0,1s	Always
0260	F260	Frequency in Intermittant Operation („JOG“-Mode)	0,0Hz ... 20,0Hz	0,1Hz	Always
0261	F261	Method of Braking in Intermittant Operation („JOG“-Modus)	0: Ramp-down 1: Free Motor Running 2: DC Braking	-	Always
0270	F270	Jump Frequency #1 (see Parameter F271)	LL ... UL	0,1Hz	Always
0271	F271	Frequency Range for Jump Frequency #1 Parameter F270 and F271 determine the fading frequency range of (F270 - F271) to (F270 + F271).	0,0Hz ... 30,0Hz	0,1Hz	Always
0272	F272	Jump Frequency #2	LL ... UL	0,1Hz	Always
0273	F273	Frequency Range for Jump Frequency #2	0,0Hz ... 30,0Hz	0,1Hz	Always
0274	F274	Jump Frequency #3	LL ... UL	0,1Hz	Always
0275	F275	Frequency Range for Jump Frequency #3	0,0Hz ... 30,0Hz	0,1Hz	Always
0280	F280	Fixed Frequency Nr. 1 (identical to Parameter Sr1)*	LL ... UL	0,1Hz	Always
0281	F281	Fixed Frequency Nr. 2 (identical to Parameter Sr2)*	LL ... UL	0,1Hz	Always
0282	F282	Fixed Frequency Nr. 3 (identical to Parameter Sr3)*	LL ... UL	0,1Hz	Always
0283	F283	Fixed Frequency Nr. 4 (identical to Parameter Sr4)*	LL ... UL	0,1Hz	Always
0284	F284	Fixed Frequency Nr. 5 (identical to Parameter Sr5)*	LL ... UL	0,1Hz	Always
0285	F285	Fixed Frequency Nr. 6 (identical to Parameter Sr6)*	LL ... UL	0,1Hz	Always

0286	F286	Fixed Frequency Nr. 7 (identical to Parameter Sr7)*	LL ... UL	0,1Hz	Always
0287	F287	Fixed Frequency Nr. 8	LL ... UL	0,1Hz	Always
0288	F288	Fixed Frequency Nr. 9	LL ... UL	0,1Hz	Always
0289	F289	Fixed Frequency Nr. 10	LL ... UL	0,1Hz	Always
0290	F290	Fixed Frequency Nr. 11	LL ... UL	0,1Hz	Always
0291	F291	Fixed Frequency Nr. 12	LL ... UL	0,1Hz	Always
0292	F292	Fixed Frequency Nr. 13	LL ... UL	0,1Hz	Always
0293	F293	Fixed Frequency Nr. 14	LL ... UL	0,1Hz	Always
0294	F294	Fixed Frequency Nr. 15	LL ... UL	0,1Hz	Always

The parameters F280 **to** F286 **are identical to the Parameters** Sr1 **to** Sr7 **. A change in one of the parameters results in the similar change in the corresponding parameter.**

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0300	F300	Carrier Frequency for the Pulse Width Modulation	2,2kHz ... 12,0kHz	0,1kHz	Always
0301	F301	Motor Capture Function	0: Switched Off 1: by short time power interruptions 2: By short time Reference Value Block (ST-Signal) 3: Combination from function 1 and 2	-	Always
0302	F302	Characteristics during power supply failure	0: Operation is interrupted 1: Operation is continued through the feedback energy from the motor circuit.	-	Always
0303	F303	Number of Restarts after fault („Trip“)	0 ... 10	1	Always
0304	F304	Connection of an external braking resistance (This is connected to PA und PB terminals of an inverter)	0:No external braking resistance 1: External braking resistance Exists	-	Always
0305	F305	„Soft Stall“-Control for ramp-down This control avoids the fault (Over Voltage), in which, by too high DC link voltage results in dynamic lengthening of ramp-down.	0: Standard level 1: Switched Off 2**: High level	-	Always
0306	F306	Output Voltage Level (maximum output voltage based on Input Voltage value)	0 ... 120%	1%	Always
0307	F307	Supply Voltage Compensation (Fluctuations of the input voltages are not passed on to the output)	0: Switched Off 1: Switched On	-	In Stop
0308	F308	Thermal Overload Protection for the Braking This parameter determines the permissible switching time for the connected braking resistance. It is calculated from the ratio of Total Cycle Time (= Acceleration Time + Time Constant of the drive + Braking time) to the Braking time. This determines the reciprocal ED- value. Ensure that the connected braking resistance is calculated for the desired braking power. Your TOSHIBA sales representative can help you in the selection of the braking resistance.	1 ... 255 255 ⇒ 100% 0 ⇒ 0%	1	Always

0360	F360	PI-Control With this parameter, PI-Control can be swittched on. For operation with PI-Control, terminals VIA (0 ... 10V DC) or Klemme II (0(4) ... 20mA) serve as inputs for the feedback signal. Parameter F200 then has no function.	0: Switched Off 1: Operation with PI-Control	-	Always
0362	F362	P-Component The P-component has the influence on the reaction time of the controller.	0,01 ... 100,0	0,01	Always
0363	F363	I-Component The I-component ensures that no deviation between the set value and the actual value exists.	0,01 ... 100,0	0,01	Always

***Only above V.121*

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0400	F400	Automatic setting	0: No effect 1: Result of the Auto-Tuning-Operation 2: Auto-Tuning-Operation	-	In Stop
0401	F401	Motor Constant 1 (Slip)	0 ... 255	1	Always
0402	F402	Motor Constant 2 (Stator Resistance)	0 ... 255	1	In Stop
0403	F403	Motor Constant 3 (Rotor resistance)	0 ... 255	1	In Stop
0404	F404	Motor Constant 4 (Main Inductance)	0 ... 255	1	In Stop
0405	F405	Inertia (Referred to the Motor Shaft)	0: Small 1: Medium 2: Large 3: Very Large	-	Always

*** The Motor parameters** F402 **to** F404 **are determined from the inverter itself, when it carries out Auto-Tuning mode. For that, please select under the BASIC PARAMETERS #1 the value of 1 or 2 (as per the Motor frequency) for Parameter** AU3 **and for the Parameter** AU2 **, a value of 3 or for** F400 **a value of 2. After each Auto-Tuning run the parameter** F400 **jumps to the value of 1.**

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0500	F500	Ramp-up Time #2 The ramp-up time is referred as acceleration time from stand-still up to the maximum frequency FH	0,1s ... 3600s	0,1s	Always
0501	F501	Ramp-down Time #2 The ramp-down time is referred as deceleration time from the maximum frequency FH to stand-still.	0,1s ... 3600s	0,1s	Always
0502	F502	Ramp form for the Acceleration / Deceleration Times #1	0: Linear ramp-up (Constant Acceleration) 1: Ramp-up with increasing or decreasing acceleration at the beginning or end (S-Curve) 2: Ramp-up with sinking acceleration at the end (C-Curve)	-	Always
0503	F503	Ramp form for the Acceleration / Deceleration Times #2	(see Par. F502)	-	Always

0504	F504	Selection of ramp-up / ramp-down parameter #1 or #2	0: ramp-up / ramp-down parameter #1 1: ramp-up / ramp-down parameter #2	-	Always
0505	F505	Switching Frequency between ramp-up / ramp-down #1 and #2 (The arrangement of the ramp-up / ramp-down times for the corresponding frequency ranges is determined via Parameter F504 or over the Input-terminals with AD2-Function. (see section 7.10). Standard arrangement is ramp-up / ramp-down #1 for the lower freq. Range and ramp-up / ramp-down #2 for the upper freq. Range .	0,0Hz ... UL	0,1Hz	Always

Address HEX	Display FU	Parameter description		Setting Range	Resolution	Access
0600	F600	Ratio of Motor load to FU – Rated Load	This parameter determines how big the the motor rated current is with respect to the inverters's output current. By correct setting of this parameter, the thermal protection of the	10% ... 100%	1%	Always
0601	F601	Threshold for the „Soft-Stall"-control Adjustment of the overload ratio of the motor rated current to the inverter rated current, above which the „Soft-Stall"-control is initiated. (see also Parameter OLM, basic parameter #1).		10% ... 199% (200% = Switched off)	1%	Always
0602	F602	Fault Mode		0: Fault is erased after the switch off of supply voltage 1: Fault is NOT erased after the switch off of supply voltage	-	Always
0603	F603	Characteristics on Emergency Stop / External Fault		0: Free Run-down 1: Ramp-down 2: DC Braking	-	Always
0604	F604	Time span of the Dc braking on Emergency Stop / External Fault		0,0s ... 20,0s	0,1s	Always
0605	F605	Monitoring of Output power terminals (Motor cables) for phase failure.		0: No Monitoring 1: By first switch on 2: By reference value Enable	-	Always
0616	F616**	Over current threshold value (Switching of the digital outputs Out 1, Out 2 and the output relay FLA, in case so programmed).		10 ... 200 (%)	0,1%	Always
0618	F618**	Over current threshold Time (Switching of the digital outputs Out 1, Out 2 and the output relay FLA, in case so programmed).		0,0 ... 10 (s)	0,1%	Always

***Only above V.121*

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0700	F700	Parameter Block With Blocked Parameters, only parameter F700 can be changed. All other parameters are readable but bot changeable.	0: Not Blocked (Parameter CMOD and FMOD not changeable in operation) 1: Blocked 2: Not Blocked (Parameter CMOD and FMOD changeable in operation)	-	Always
0701	F701	Display of Current, Voltage and Frequency values. Voltage and current values can be displayed as referenced to rated values (in %) or as Absolute values (in V or A). Anstatt der Frequenz kann eine frequenz-proportionale Größe ausgegeben werden. Ein entsprechender Multiplikator ist unter Parameter F702 festzulegen.	0: Frequency in [Hz]; Current, Voltage in [%] 1: Frequency in [Hz]; Current, Voltage as Absolute values 2: Frequency-proportional value : Current, Voltage in [%] 3: Frequency-proportional value ; Current, Voltage as Absolute values	0,1s	Always
0702	F702	Multiplier for frequency proportional Display	0,01 ... 200,0	0,01	Always

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
0800	F800	Data Transmission Rate over interface	0: 1200 baud 1: 2400 baud 2: 4800 baud 3: 9600 baud	-	Always
0801	F801	Parity	0: None 1: Even 2: odd	-	Always
0802	F802	Inverter Identification Number Up to 32 inverters can be addressed over the inetrface. In order to correctly address each inverter, for each unit that is connected to the Bus system, another identification number must be given.	0 ... 31	-	Always
0803	F803	Time Dealy on Communication Fault Time, after which a Fault annunciation is generated in case of communications failure over the interface.	0 ... 100	1	Always

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
FA00		Command Register	00000 ... FFFFF	-	Always
FA01		Freq. –Reference Value Communication	0,0Hz ... FH	0.01 Hz	Always
FA02		Freq. –Reference Value Control Panel	0,0Hz ... FH	0.01 Hz	Always

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
FC90		Aktueller Fehler	-	-	Read

Address HEX	Display FU	Parameter description	Setting Range	Resolution	Access
FD00		Freq. Actual Value	-	0,01 Hz	Read
FE00		Freq. Actual Value – Fault Register	-	0,01 Hz	Read
FE01		Status word (see 10.2.3 Tabel 2)	-	-	Read
FE02		Freq. –Reference Value	-	0,01 Hz	Read
FE03		Motor Current	-	0,01 %	Read
FE04		Input Voltage	-	0,01 %	Read
FE05		Output Voltage	-	0,01 %	Read
FE06		Status of the Digital Inputs	-	-	Read
FE07		Status of the Digital Outputs	-	-	Read
FE08		CPU – Version	-	-	Read
FE09		EEPROM – Version	-	-	Read
FE10		Fault Memory 1	-	-	Read
FE11		Fault Memory 2	-	-	Read
FE12		Fault Memory 3	-	-	Read
FE13		Fault Memory 4	-	-	Read
FE14		Operation Time	-	0,01 / h	Read

Hint :

The Parameters 0800H, 0801H, 0802H and 0803H remain untouched by the resetting of the adjustments. Changes in the settings of the transmission rate and parity of the serial interface are taken into account only after fresh initialization of the VF S7 (Switch off and re-Switch-on of the power supply of VF S7). Modify these parameters only when it is absolutely necessary.

After a fault condition, control allows read out of the fault code, responsible for switch of , from the Fault register of the inverter (FE10H - FE13H) . (the already stored „ Old-Fault Codes“ are pushed over by „ New- faults“ successively from FE10H nach FE13H.

9.2.3 **Description of the Communication Commands and Status Parameters**

*9.2.4 Table 1: (*FA00H*) Bit-Structure of Command Words*

Bit	Funktion	0	1
15	Command Word Valid (*FA00H*) [1]	Invalid	Valid
14	Freq. Reference Value Valid (*FA01H*) [2]	Invalid	Valid
13	Re-adjustment after Switch Off	OUT	Re-adjustment
12	Emergency Stop	OUT	Quickstop
11	Free Stop	OUT	Free Run
10	Operation/Stop	Stop	Operation
9	Clockwise/ Anti-clockwise Run	Clockwise	Anti-clockwise
8	Intermittant Operation (JOG)	OUT	JOG
7	DC Switching (dCI)	OUT	DCI
6	ACC / DEC #1/#2 – Switching	#1	#2
5	(reserved)	-	-
4	(reserved)	-	-
3	Fixed Frequency #4	OUT	ON
2	Fixed Frequency #3	OUT	ON
1	Fixed Frequency #2	OUT	ON
0	Fixed Frequency #1	OUT	ON

[1] If this Bit 15 is set, the VF S7 is controlled over the serial interface and the signals applied to the logic inputs are eventually ignored.
[2] By setting of the Bit 14 , the signals applied to Analogue inputs are eventually ignored and the the reference value transmitted over the serial interface takes priority.

Table 2: (FE01H) Bit-Structure of the internal VF S7-Status words

Bit	Function	0	1
15	(reserved)	-	-
14	(reserved)	-	-
13	(reserved)	-	-
12	(reserved)	-	-
11	(reserved)	-	-
10	Operational Status [1]	Stopped	Runs
9	Direction of Rotation	Clockwise	Anti-clockwise
8	Intermittant Operation (JOG)	-	JOG
7	DC Switching (dCI) (dCI)	-	dCI
6	ACC / DEC #1/#2 – Status	#1	#2
5	(reserved)	-	-
4	(reserved)	-	-
3	(reserved)	-	-
2	(reserved)	-	-
1	(reserved)	-	-
0	(reserved)	-	-

[1] During the DC switching this Bit remains set (Signal: Drive Runs)

Hint: This S7-internal Status word is not identical to the Status word as per Profibus.

Table 3: (FE06H) Bit-Structure of the LI-Words

Bit	Terminal	Function	Terminal ON-Data
0	F	Digital Input 1	1 = Input Set (1h)
1	R	Digital Input 2	1 = Input Set (2h)
2	RST	Digital Input 3	1 = Input Set (4h)
3	S1	Digital Input 4	1 = Input Set (8h)
4-15	S2	Digital Input 5	1 = Input Set (10h)

Example:

If the Inputs F and S1 are set, *FE06* has the Value: 01h + 08h = 0009h.

Table 4: (FE07H) Bit-Structure of the LO-Words

Bit	Terminal	Function	Terminal ON-Data
0	OUT1	Output Terminal 1	1 = Output Set (1h)
1 - 15	OUT2	Output Terminal 2	1 = Output Set (2h)

Examplel:

If the Outputs 1 and 2 are set, *FE06* ha the Value : 01h + 02h = 0003h.

9.2.5 Fault Messages

This table contains all the values, which the Fault Words *FC90H*, *FE10H*, *FE11H*, *FE12H* und *FE13H* can take.

The Fault Word 0023H contains in the fault-free status of the inverter the last occuring fault , in case of fault, this Fault Word has the Fault Code of the actual fault.

Fault Code	Value	Fault Type
nErr	*0000*	No fault
OC1	*0001*	Over Current During Ramp-up
OC2	*0002*	Over Current During Ramp-down
OC3	*0003*	Over Current During Constant Speed
OCL	*0004*	External Phase Short Circuit (Load Side)
OCA	*0005*	Internal Phase Short Circuit (Power Circuit)
	0006	Reserved
	0007	Reserved
(EPH1)	*0008*	Reserved
EPHO	*0009*	Failed Output Phase
OP1	*000A*	Over Voltage During Ramp-up
OP2	*000B*	Over Voltage During Ramp-down
OP3	*000C*	Over Voltage During Constant Speed
OL1	*000D*	Inverter Overload
OL2	*000E*	Motor Overload
OLr	*000F*	Brake resistor Overload
OH	*0010*	Overheating
E	*0011*	Emergency Stop
EEP1	*0012*	EEPROM – Fault
	0013	Reserved
	0014	Reserved
Err2	*0015*	RAM - Fault
Err3	*0016*	ROM - Fault
Err4	*0017*	CPU - Fault
Err5	*0018*	Communications Fault
	0019...0024	Reserved
OCr	*0025*	Brake Resistor Fault
	0026...0027	Reserved
Etn	*0028*	Auto-Tuning - Fault
EtYP	*0029*	Inverter Initialization Fault