Motors | Automation | Energy | Transmission & Distribution | Coatings

I/O CAN Master controller & Fast Link Communication card

EXP-FL-XCAN-ADV

ADV Firmware 6.0.0 and higher

Instruction manual

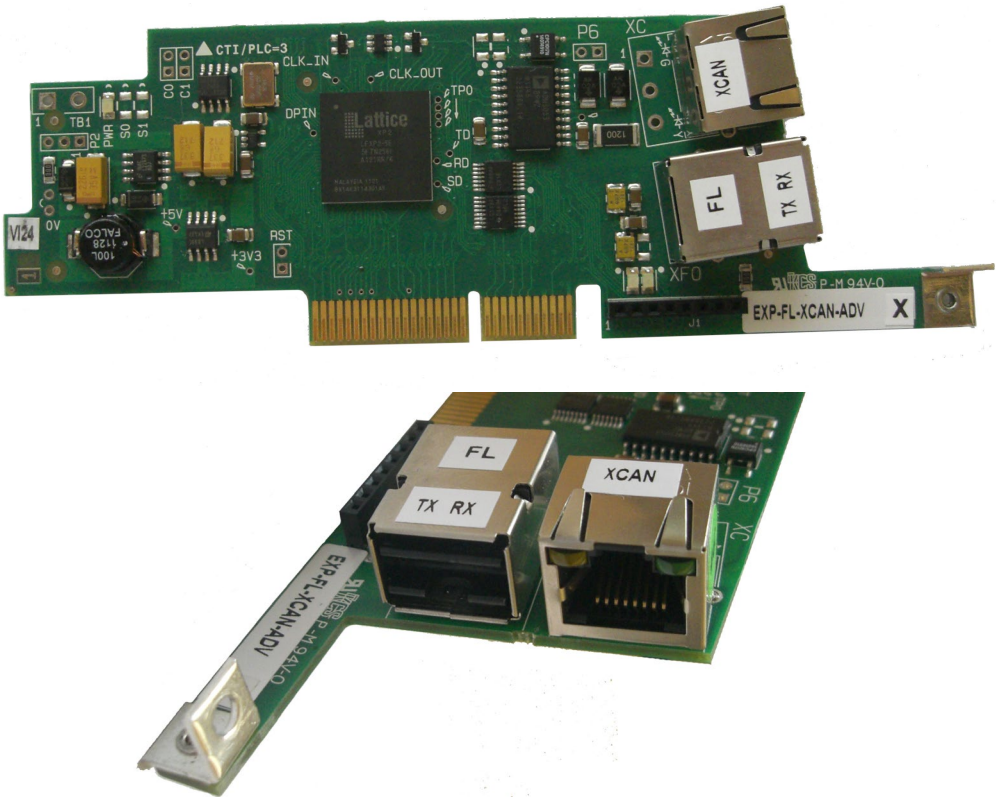
Language: English

Thank you for selecting this WEG product.
If you have any information that might help us to improve this manual, please do not hesitate to contact us at WEG Automation Europe S.r.l..
Before using the product, please read the chapter on safety instructions carefully.
Keep the manual in a safe place and available to technical personnel during the product functioning period.
WEG Automation Europe S.r.l. reserves the right to make changes and variations to products, data and dimensions at any time without notice.
The data indicated are provided for the sole purpose of describing the product and must not be considered as legally binding characteristics.

TABLE OF CONTENTS

1 Introduction

The EXP-FL-XCAN-ADV expansion card can be used to increase the number of external I/Os managed by the ADV200 drive (CAN Master function). FastLink communication allows several drives to be linked to perform synchronisation.



Fast Link Communication HW/FW cross reference

EXP-FL-.. Hardware Revision	Fast Link One way (Mono directional)	Fast Link Two way (Bi-directional)
V1.02	YES	NO
V1.03	YES	YES

ADV200 Drive Firmware	Fast Link One way (Mono directional)	Fast Link Two way (Bi-directional)
V6.0.0	YES	NO
≥ V7.0.0	YES	YES

Warning!

Attention: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber-optic cable connectors.

2 Introduction to the CAN Master function

The ADV200 drive's standard regulation card manages the following I/Os:

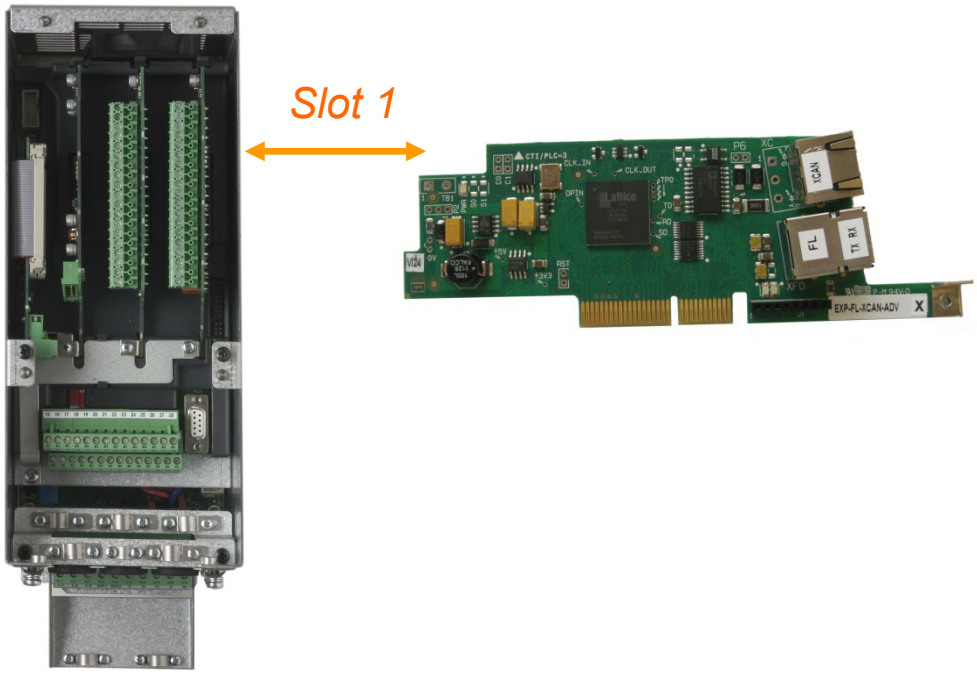
Digital inputs	Digital outputs	Digital relay outputs	Analog Inputs	Analog Outputs
1 +5	2	2	2	2
		(2 NO contacts)	Voltage and current inputs. (selection via switch + parameter)	Voltage outputs. The second is also a current output. (selection via switch + parameter)

In some applications the drive is required to manage more I/Os than this. With the EXP-FL-XCAN-ADV card (inserted into **expansion slot 1** of the drive) an external I/O device can be connected via CAN interface *(CANopen with "DS401 Device for generic IO modules" profile)*.
Only one external I/O device can be used.
Communication is performed via the "DS401 Device profile for generic IO modules".

The maximum number of I/Os that can be managed is as follows:

- *64 digital inputs (sample time = 8 ms) (16 DI with standard fw only)*
- *64 digital outputs (sample time = 8 ms) (8 DO with standard fw only)*
- *8 analog inputs (sample time = 8 ms) (2 AI with standard fw only)*
- *8 analog outputs (sample time = 8 ms) (2 AO with standard fw only)*

The standard drive firmware manages a limited number of external I/Os. With the MDPlc application it is possible to manage the number of I/Os shown above



Note! When CAN MASTER Function is used,it is not possible to manage an additional "EXP-CAN/DN-ADV" optional communication board

3 Description of the system

Insert the EXP-FL-XCAN-ADV expansion card into slot 1 of the drive and use a CAN cable to connect it to the external communication module.
The external modules being managed must be able to communicate via CANopen at a baudrate of 500 kbps.
The address of the external communication module must be set to 1.
The ADV200 can manage a single slave device and uses the “DS401 Device profile for generic IO modules”. The system of reference is the Gefran GILOGIK II device (but any other equivalent and suitably configured device may be used), to which the slave communication module and I/O modules are connected.
Configuration files are currently available for the following CAN interfaces:

- Gefran R-GCANs
- Wago 750-347 ECO CANopen *(sample time = 16 ms)*
- Beckhoff BK5110 *(sample time = 16 ms)*

Communication between the drive and external module is based on 4 PDO-RX and 4 PDO-TX
PDO size is:

64 bit	8 Uint8	4 Uint16	2 Uint32

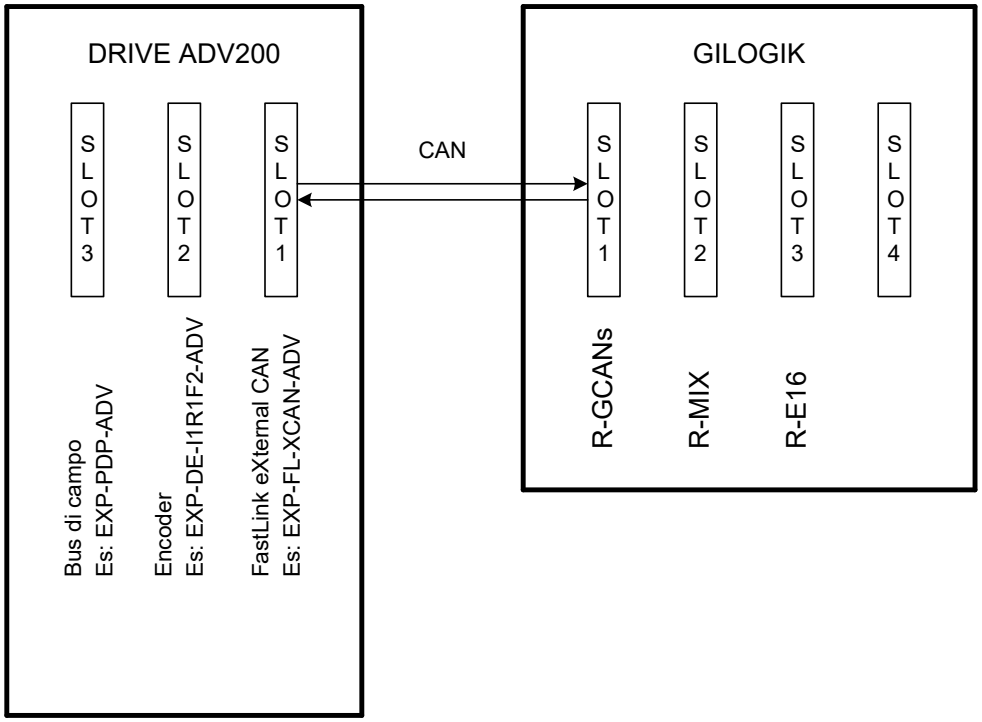
The following data are exchanged in the PDOs:

1 PDO-RX	64	Digital Input (bit)
2 PDO-RX	8	Analog Input (Uint16)
1 PDO-RX		Free

1 PDO-TX	64	Digital Output (bit)
2 PDO-TX	8	Analog Output (Uint16)
1 PDO-TX		Free

The external slave communication module recognises the I/O modules installed in order of slot, from left to right, and maps the I/Os detected in the same order in the appropriate PDO.
In some configurations, the I/Os installed are not sufficient to saturate all the PDOs, or the I/Os installed exceed the fixed size of the PDOs. Operation is possible in both cases. If the I/Os installed are not sufficient to saturate the PDOs the system works with the resources actually present in the I/O modules. If the I/Os installed saturate the PDOs, the system works with the maximum number allowed.
Use parameter 5482 External IO info to know the number of I/Os installed. Reference should be made to the relative section in the ADV200 drive manual.

EXP-FL-XCAN-ADV card recognition codes = 0x0340 = 832.



Control_Exp_Ext_IO_01.vsd

The drive recognises the external device as the EXP-D6A4R1-ADV expansion card (option to be installed onboard the drive) but with a different number of I/Os.
The parameters used to manage the external device are the same as those used to manage the EXP-D6A4R1-ADV card.
For this reason, the EXP-D6A4R1-ADV card and the external device cannot be managed together.
Use parameter 5480 “External IO enable“ to enable communication with the external device.

The following are available on the drive via I/O management parameters:

Type	No.	Description
DI	5-+1	Digital input on the drive regulation card DIs are managed via the src parameter selection lists
AI	2	Analog input on the drive regulation card AIs are managed via the src parameter selection lists
DO	4	Digital output on the drive regulation card
AO	2	Analog output on the drive regulation card
DI	16	External digital inputs via CAN DIs are managed via the src parameter selection lists
AI	2	External analog inputs via CAN AIs are managed via the src parameter selection lists
DO	8	External digital outputs via CAN
AO	2	External analog outputs via CAN

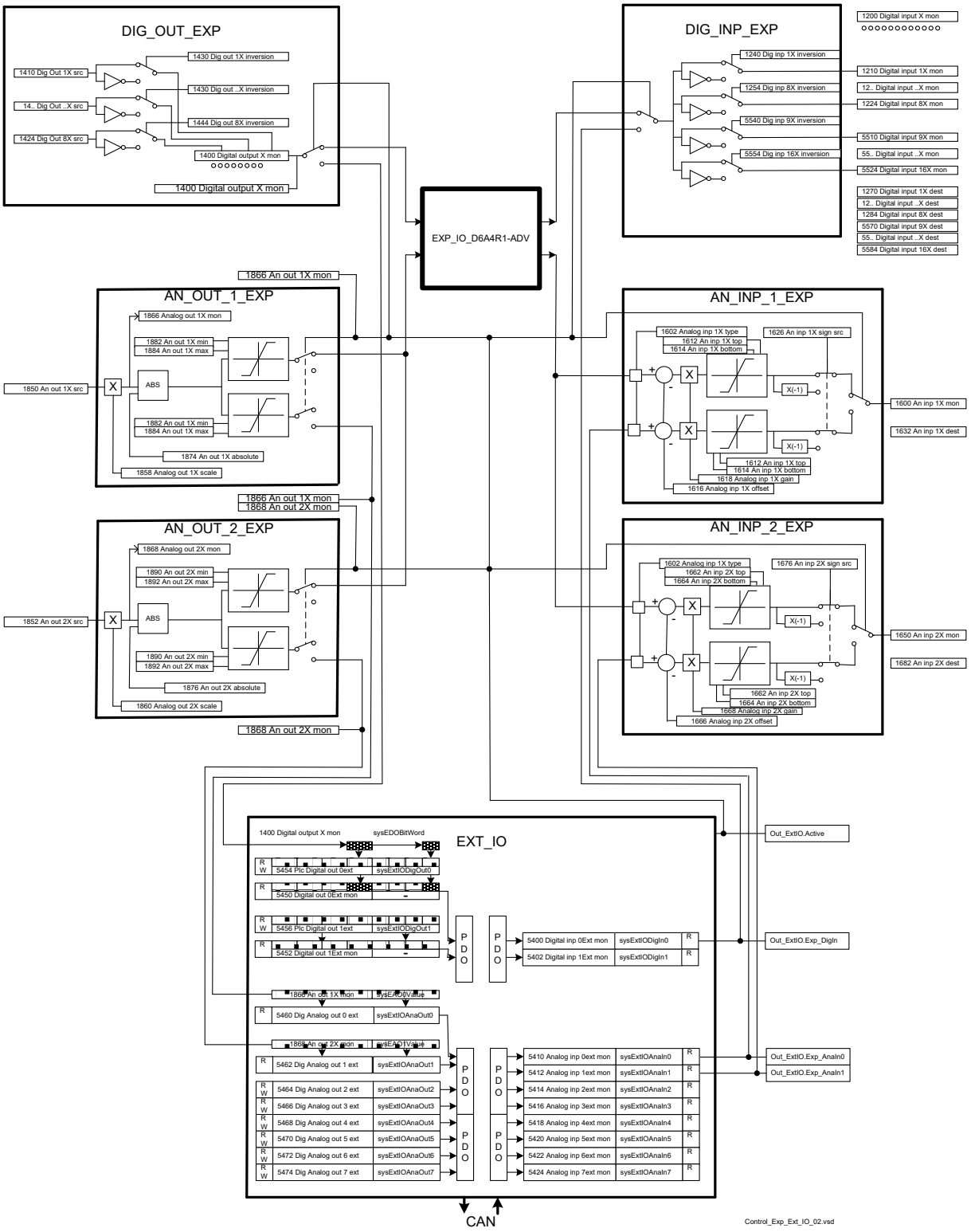
Through the MDPlc environment you can:

- Read the state of the 5+1 DIs on the drive regulation card via the MDPlc system variables in the DIGITAL INPUT group.
  Read the state of the 16 external DIs via the MDPlc system variables in the DIGITAL INPUT EXP group. The state of all 64 possible external DIs can be read via the sysExtIODigIn0 and sysExtIODigIn1 system variables in the EXTIO group.
- Read the value of the 2 AIs on the drive regulation card via the MDPlc system variables in the ANALOG INPUT group.
  Read the value of the 2 external AIs via the MDPlc system variables in the ANALOG INPUT EXP group.
  The value of all the 8 possible external AIs can be read via the sysExtIOAnaIn0 and sysExtIOAnaIn1 system variables in the EXTIO group.
- Write the state of 4 DOs on the drive regulation card + 8 external DOs via the sysWDecomp (or sysPadX) system variables. The parameters used to configure the DOs must, of course, be set to the Word Decomp (or PAD) function.
  Write the remaining 56 external DOs via two system variables sysExtIODigOut0 and sysExtIODigOut1 in the EXTIO group.
- Write the value of 2 AOs on the drive regulation card + 2 external AOs via the sysPadX system variables. The parameters used to configure the AOs must, of course, be set to the PAD function.
  Write the remaining 6 AOs via 6 sysExtIOAnaOut2 .. sysExtIOAnaOut7 system variables in the EXTIO group.

Via serial line or fieldbus you can:

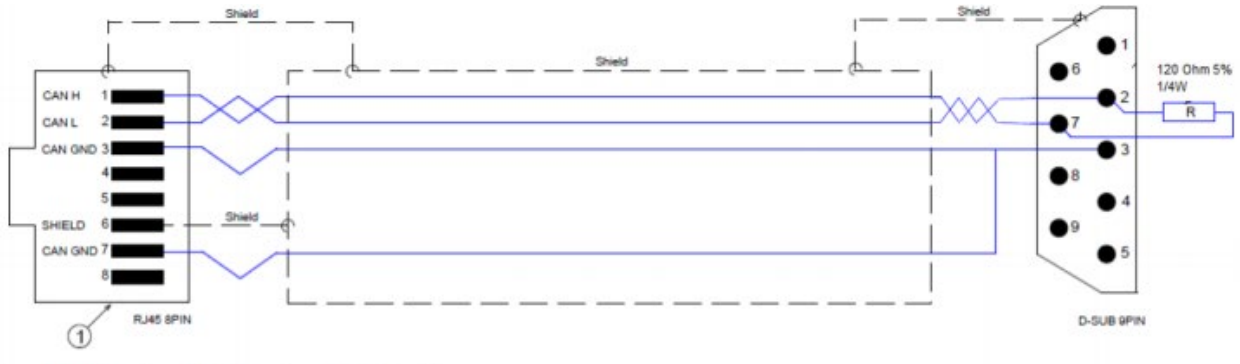
- Read the state of the 5+1 DIs on the drive regulation card via parameter 1100 in the Monitor menu.
  Read the state of the first 16 external DIs via parameter 1200 "Digitali input X mon".
  Read the state of all external I/Os via parameters 5400 "Dig inp 0Ext mon" (external digital inputs from 1 to 32).
  Read the state of all external I/Os via parameters 5402 "Dig inp 1Ext mon" (external digital inputs from 33 to 64).
- Read the value of the 2 AIs on the drive regulation card via parameters 1500 “Analog input 1 mon” and1550 “Analog input 2 mon” in the ANALOG INPUT menu.
  Read the value of the 8 external AIs via parameters 5410 “Analog inp 0Ext mon” , 5412, 5414, 5416, 5418, 5420, 5422, 5424 “Analog inp 7Ext mon”.
  The first two external AIs are also managed via the drive parameters and are therefore also available in parameters 1600 “Analog input 1X mon” and 1650 “Analog input 2X mon” in the ANALOG INPUT menu.
- Write the state of the 4 DOs present on the regulation card via parameter 4450 “Dig word decomp” (or via the PAD parameters). The parameters used to configure the DOs must, of course, be set to the Word Decomp (or PAD) function.
  Write the state of the 8 external DOs via parameter 4450 “Dig word decomp” (or via the PAD parameters). The parameters used to configure the DOs must, of course, be set to the Word Decomp (or PAD) function.
  Write the state of the remaining 56 external DOs via parameters 5454 and 5456 not visible in the drive's menu.
  The state of the 64 digital outputs can be read (after merge) via parameters 5450 "Dig out 0Ext mon" (external digital outputs from 1 to 32) and 5452 "Dig out 1Ext mon" (external digital outputs from 33 to 64) in the MONITOR menu.
- Write the value of the 2 AOs present on the regulation card via the PAD parameters. The parameters used to configure the AOs must, of course, be set to the PAD function.
  Write the value of the 2 external AOs via the PAD parameters. The parameters used to configure the AOs must, of course, be set to the PAD function.

Write the value of the remaining 6 external AOs via parameters 5464 “Dig Analog out 0 ext”, 5466, 5468, 5470, 5472 and 5474 “Dig Analog out 7 ext”, in the ANALOG OUTPUT menu.



The change in the number of external IO modules installed is detected at drive start-up and reported in a specific message.
Any 0…20 mA or 4…20 mA current analog inputs must be configured on the I/O module. This is done using the specific I/O module configurator.

4 Description of the CAN connection cable



FUNCTION	RJ45 8PIN	D-SUB 9PIN
CAN H	1	7
CAN L	2	2
CAN GND	3	3
SHIELD	6/SHIELD	SHIELD
CAN GND	7	3

Upon request: 3-meter pre-wired CAN cable.
Code: S72795

5 EXP-FL-XCAN-ADV parameters

The EXTERNAL IO submenu has been added to the COMMUNICATION menu
If the EXP-FL-XCAN-ADV card is installed, parameter 5480 External IO enable is set to “Enable”, all the relative signals are enabled and any problems with external module communication faults are managed (generation of a *27 “Ext I/O fault ”* alarm, with different subcodes to indicate the cause of the error).

6 Software management of the CANopen external I/O module

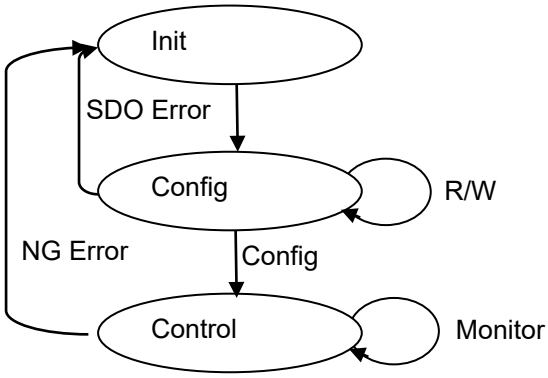
The ADV200 drive includes a subset of CANopen master functions for managing the external module. In particular, it is able to:

- Recognise the presence of a single slave at address 1 with a baudrate of 500 kbps
- Read some predefined data from the slave via SDO (see “SDO configuration” table), recognise and map the available I/Os
- Write the HeartBeat, NodeGuarding and PDO settings via SDO
- Set the slave device to Operational, exchange PDOs and monitor their state

These functions are integrated in the firmware of the drive and cannot be configured directly by the user. However, they use basic objects that should always be present in CANopen DS401 I/O modules.
Specific device manufacturer configurations must be performed externally. The objects that are supported and the sequence in which these are sent to the drive are listed in the “**SDO configuration table”**. The single slave that is connected must be equipped with CANopen DS301 according to “DS401 Device profile for generic I/O modules Version 3.0.0 3 Jun 2008” and must be set separately from the drive to operate with a baudrate of 500 kbps, with address 1.

6.1 Communication states

At drive start-up, if the EXP-XCAN-ADV card is present and parameter 5480 “External I/O enable” = “Enabled”, the state machine as shown in the figure is executed.



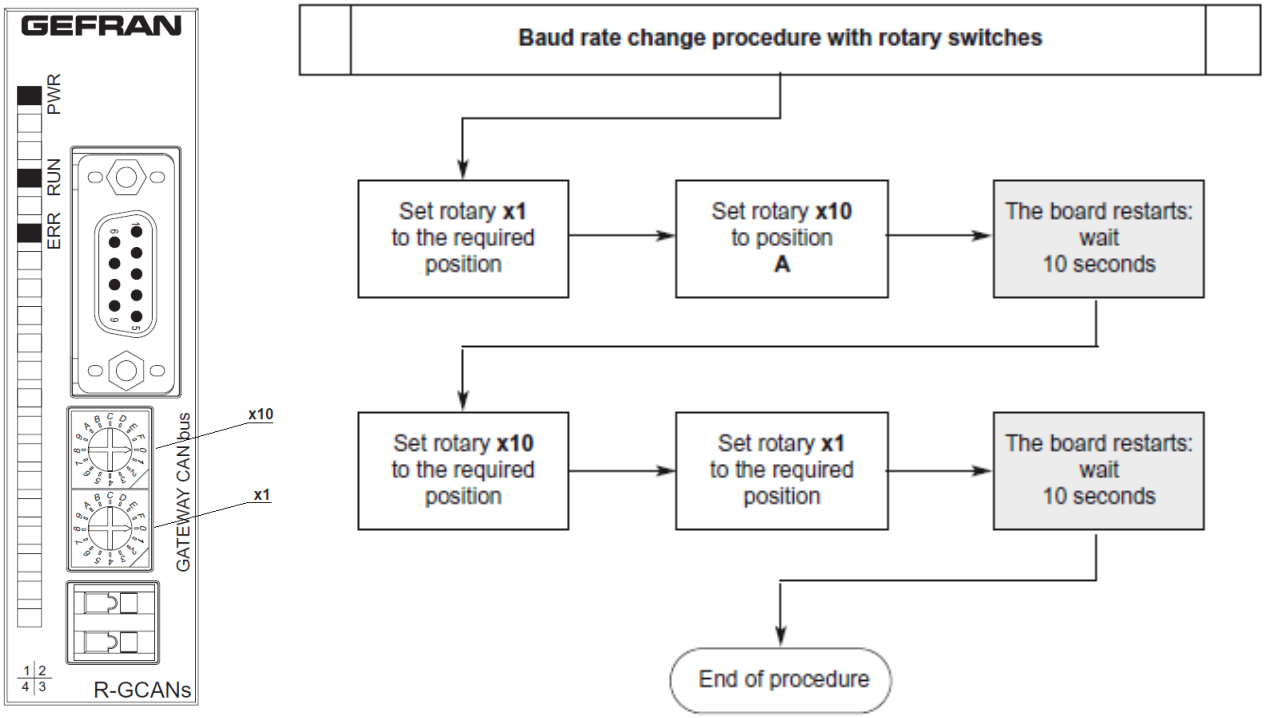
In the “Init” phase the drive sends the NMT Pre-Operational message to the slave. Next, the “Config” phase starts, in which it sends requests to read and write objects in the “**SDO configuration table”** via SDO. If the reply is incorrect or if there is no reply, the process stops and an alarm is generated with a code corresponding to the SDO with the problem.
If the SDO sequence is completed, the drive moves to “Control” mode and sends an NMT message which sets the slave to Operational. PDO exchange is now active. A Sync message is sent every 8 ms and the state of the slave is monitored via HeartBeat or NodeGuarding.
If the communication with the slave is lost, the alarm with subcode 0 (BusLoss) is generated and the drive returns to Init. If the communication with the slave is restored, the state machine is executed again, otherwise the first read SDO fails and init is repeated indefinitely.

7 Custom configuration of the module via SDO

A specific configuration can be sent to the CANopen slave module to set it according to values other than those with which it is supplied, or to read additional information.
This configuration is not sent by the drive to the module each time, but only once via a dedicated page integrated in the WEG_eXpress configuration tool.
Configuration is performed by sending SDOs to the module, and is only done once by the drive, before the configuration phase. The SDOs to be sent are loaded from a text file, editable from outside WEG_eXpress with a specific format (see the ADV200 handbook).

Besides setting the module, some CANopen communication parameters used by the drive can also be set. These parameters must coincide with the slave settings, which are generally defined with procedures that depend on the slave in use.

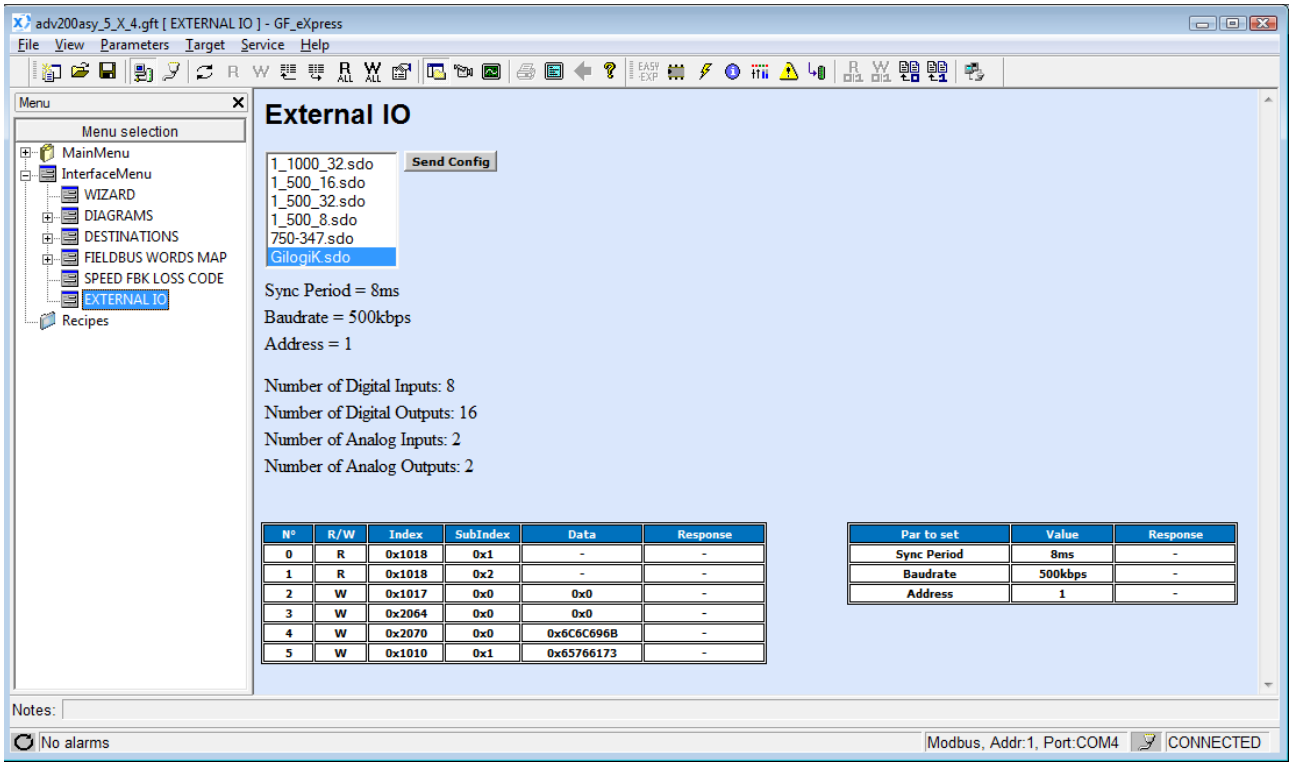
For R-GCANs modules in the Gefran GilogikII series, the baudrate and address must be set using the following procedure, with rotary switches X1 and X10 on the module:



The module is now ready to work with baudrate = 500 kbits and address = 1.

7.1 Configuration page

This page can be accessed from the Interface Menu / EXTERNAL IO.



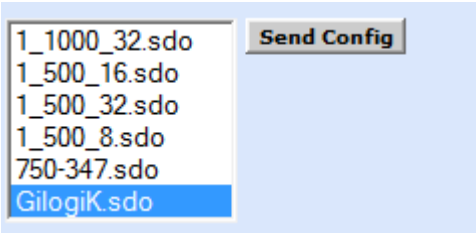
It shows information about the CANopen master communication parameters currently used by the drive:

Sync Period = 8ms
Baudrate = 500kbps
Address = 1

The values shown above are the default values. They can be changed by loading an .sdo file with this page or via the SERVICE->EXT IO SERV menu after entering the password.
The page also shows the number of I/Os available on the module.
In the example shown above:

Number of Digital Inputs: 8
Number of Digital Outputs: 16
Number of Analog Inputs: 2
Number of Analog Outputs: 2

The .sdo configuration files (see 16.2) in the C:\Program Files\WEG\Catalog\Drives\Inverter\ADV200\ADV200_5_X_4\Res\Sdo folder are automatically listed on the page.



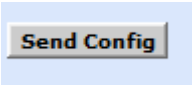
Select “GilogiK.sdo” if the external CAN interface module is manufactured by Gefran
Select “750-347.sdo” if the external CAN interface module is the WAGO 750-347
Select “1_500_16.sdo” if the external CAN interface module is the Beckhoff BK5110

If you select the Gilogik.sdo file (which can be used to set the values required to connect the Gefran R-GCANs module), the following tables are generated:

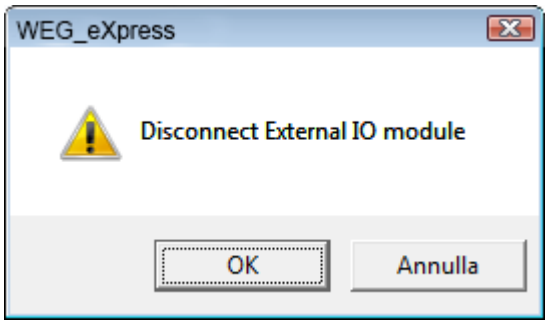
N°	R/W	Index	SubIndex	Data	Response
0	R	0x1018	0x1	-	-
1	R	0x1018	0x2	-	-
2	W	0x1017	0x0	0x0	-
3	W	0x2064	0x0	0x0	-
4	W	0x2070	0x0	0x6C6C696B	-
5	W	0x1010	0x1	0x65766173	-

Par to set	Value	Response
Sync Period	8ms	-
Baudrate	500kbps	-
Address	1	-

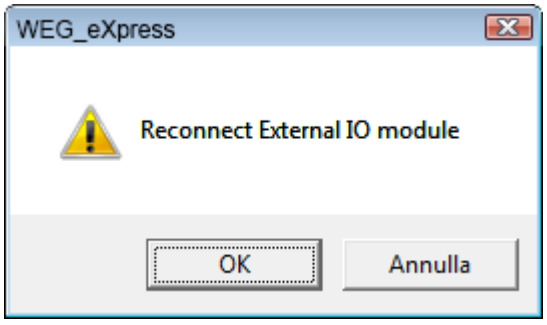
To enable the configuration of the selected file and send the necessary data to the module, press



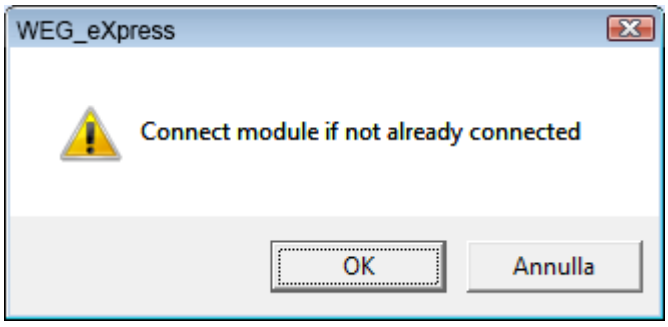
If the communication with the module is active, the following message is displayed



To continue, disconnect the CAN cable from the module. The following message is displayed if the communication is not active:



If the “Send Config” command is sent when the CAN module is not connected or the communication is not active (for instance, due to an incorrect baudrate setting), the following message is displayed:



When you connect the module, the system is ready to send the SDOs (the state machine that manages CANopen waits in Config) .
Press “OK” to start sending SDOs. When completed successfully, the response is displayed in the right hand column.

Example of successfully completed configuration:

Done

N°	R/W	Index	SubIndex	Data	Response
0	R	0x1018	0x1	-	0x21
1	R	0x1018	0x2	-	0x15B
2	W	0x1017	0x0	0x0	Ok
3	W	0x2064	0x0	0x0	Ok
4	W	0x2070	0x0	0x6C6C696B	Ok
5	W	0x1010	0x1	0x65766173	Ok

Par to set	Value	Response
Sync Period	8ms	Done
Baudrate	500kbps	Done
Address	1	Done

For read SDOs (R/W column = R) the response may be the value read or “Error” if the SDO was not executed successfully (module no longer connected, object not present in the module's Object Dictionary).
For write SDOs, the response is “Ok” or “Error” if the SDO fails (object not present or not writeable).
If parameter 5480 “External IO enable” = “Disable” the SDOs are not sent and "Skipped" is displayed in the response column
For the “Sync Period”, “Baudrate” and “Address” parameters (which do not correspond to SDOs and are only written in the drive) the right hand column only returns “Error” if writing of the parameter via WEG_eXpress fails.

Example of incomplete configuration:

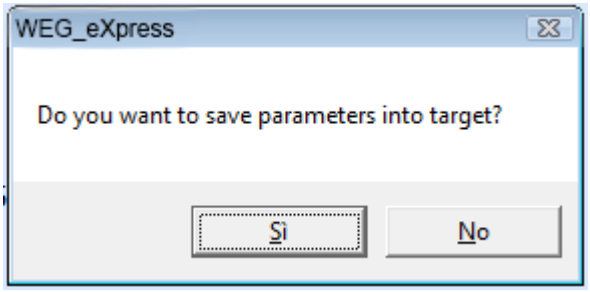
Done

N°	R/W	Index	SubIndex	Data	Response
0	R	0x1018	0x1	-	0x21
1	R	0x1018	0x2	-	0x15B
2	W	0x1017	0x0	0x0	Ok
3	W	0x2064	0x0	0x0	Error
4	W	0x2070	0x0	0x6C6C696B	Error
5	W	0x1010	0x1	0x65766173	Ok

Par to set	Value	Response
Sync Period	8ms	Done
Baudrate	500kbps	Done
Address	1	Done

Configuration is only completed successfully if there are no “Error” or “Skipped" messages in the “Response” columns. Otherwise you must find the cause of the error by making sure the .sdo file is that specified in the module documentation, checking the correctness of data and verifying the CAN network.

When configuration has been completed, you will be asked to save the parameters so that the settings remain enabled.



Wait for this to be confirmed and then press OK.

The state machine is now ready to resume its normal cycle and the device is automatically set again to Operational. If configuration is still not correct, the “Opt ExtIO” alarm is generated again.

8 SDO configuration file format

This is a text file that contains two columns separated by a comma.
On each line, the first column contains the first 4 bytes of the SDO message in hexadecimal format, the second column contains the remaining 4 bytes.

For example, to read the object with index 1000h subindex 0 the format is:
0x00100040,0

You can enter comments by starting the line with "//". Below is a file with examples of reading, writing and comments:

```
//Configuration to set the R-GCANs to recognise modules automatically
//Restart the module after sending the SDOs
0x01101840,0
0x02101840,0
0x0010172B,0
0x0020642B,0
0x00207023,0x6c6c696b
0x01101023,0x65766173
// N.B.: SyncPeriod must be 2^n and more than or equal to 16
SyncPeriod=8
//N.B.: Baudrate must be 125,250,500,1000, default = 500
Baudrate=500
Address=1
```

8.1 Setting the drive CANopen master communication parameters

The configuration files can also be used to change the CANopen communication settings, more specifically the baudrate, the address of the slave node and the communication cycle (sync message period).
Specific commands can therefore be placed in the file and are saved with the drive parameters.
The command for the baudrate is as follows:
Baudrate=500
It must be stated in kbps. Acceptable values are 125, 250, 500, 1000 , the default value is 500. Other values are not accepted.

The command for changing the node address is
Address=1

For the communication cycle you must enter a value with a power of 2. The minimum value is 8, the maximum is 256.

SyncPeriod =8

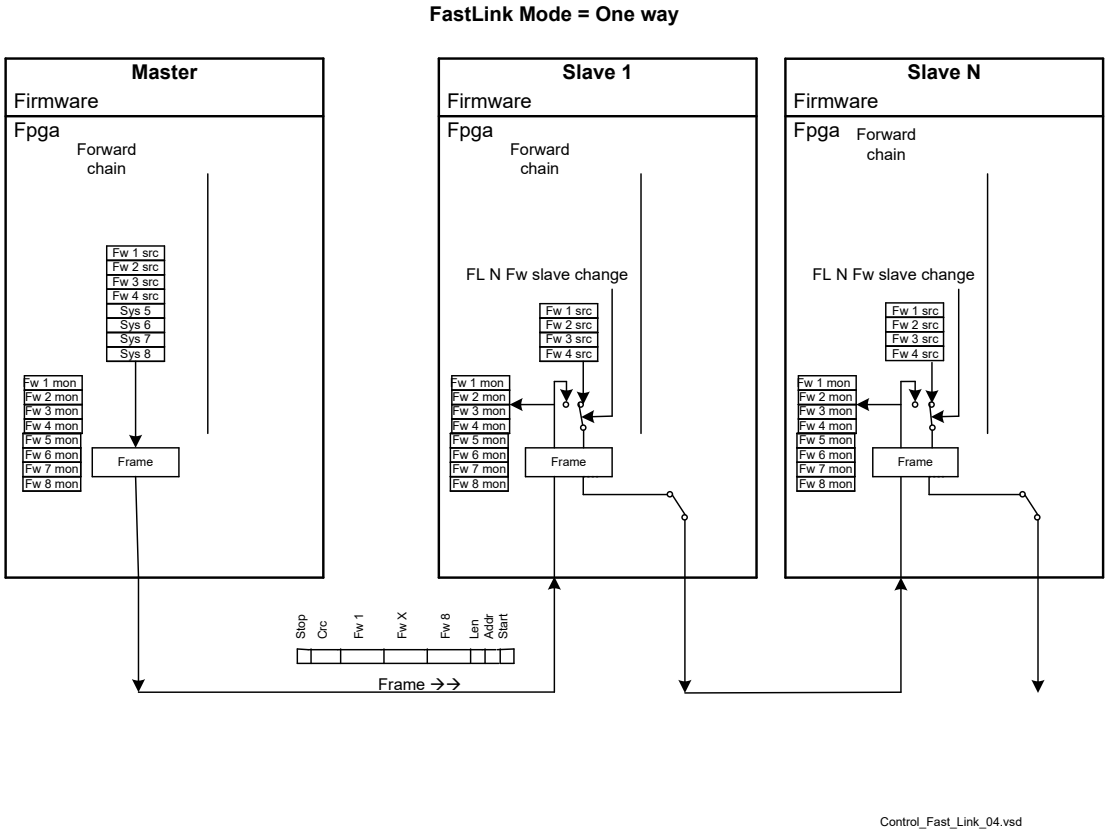
These settings are optional and may all be present, or just some. It is important to remember that they are saved in the memory of the drive, not of the module and must therefore be restored if the drive parameters are set to the default values.
Settings can also be accessed in the SERVICE->EXT IO SERV menu after entering the password (see Service Parameters)

9 FastLink Communication - Introduction

Applications involving coordinated operation of several drives frequently require rapid data exchange between drives and synchronisation.
Data can be transferred via a fast communication bus called FastLink, using the EXP-FL-XCAN-ADV card applied to each drive.
Data exchange can be one-way or two ways, using one way mode, the drive designated as the master device send information to the slave drives. Using two ways mode (Starting from ADV200 V7 firmware version), the drive designated as the master device send information to the slave drives, which cyclically send information back to the master.

There are two possible one-way operation modes.
In the first, the master sends the data frame to the first slave. The first slave takes all the data in the frame and sends the same frame to the next slave without making any changes. The same sequence is repeated by all the slave drives.
In the second, the master sends the data frame to the first slave. The first slave takes all the data in the frame, replaces part of the data and then sends the frame to the next slave drive. The same sequence is repeated by all the slave drives.

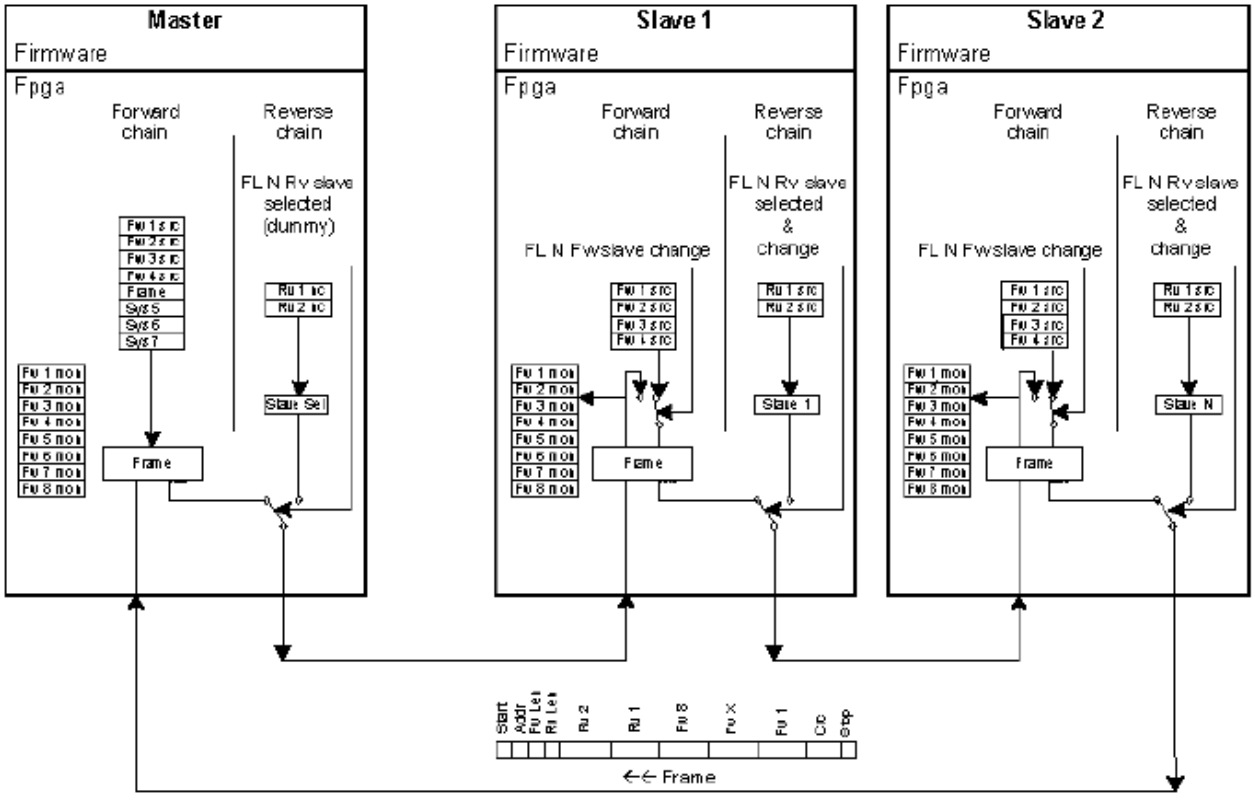
Fast Link mode – One Way (Mono-directional)



Control_Fast_Link_04.vsd

- *Physical support used: Optical fibre with daisy chain configuration*
- *Number of participants: 16 (1 Master + 15 slaves)*
- *The master can send up to 8 32-bit parameters to the slave.*
- *Each slave can replace up to 4 parameters for the next slave.*
- *Data transmission: 250 micros*
- *Synchronisation task: from 125 ms to 1 ms*
- *Maximum distance between nodes: 5 m (using a standard optical fibre cable)*
-

Fast Link mode – Two Ways (Bi-directional)



- *Number of participants: 16 (1 Master + 15 slaves)*
- *Each communication cycle one slavesend up to 2 parameters32 bit back to the master.*
- *4 Programmable slave monitor channel on the Master using basic FW*
- *32 Programmable monitor channel on the Master using MDPLC*

Using bi-directional mode (two way), the drive identified as master sends the data to the slave drives, than the slave cyclically send information back to the master.
The way where the information is sent from Master to Slave is called "**Forward**" and the way where they pass information from the slave to the master is called "**Reverse**".
The **Forward** Communication is the same indicated on the one-way mode of operation .
Bi-directional (Two way) operation mode is an extension of the one way mode . Each slave drive has the ability to send two data of information of 32 bits.

- Forward communication:

Every 250 usec The master sends the data frame to the first slave . The first slave takes all the data from the frame and send to the next unit the same frame or send the data with the ability to replace part of the data frame (as for the one way mode). The same mechanism is repeated for all the Slaves

- Reverse communication:

The last Slave drive on the drop send back the data frame to the Master.
In the frame data sent from the master to the first slave is indicated which slave device must answer. If one Slave drive is selected, it will include the information it needs to send to the master. If not selected it will pass the data frame without make changes. Last drive Slave send back the frame data to the master.
The master sends a data frame every 250 usec , in each frame data is required an answer from

the slaves.
With an appropriate parameter it can be configured the number “N” of Slaves connected. Each slave can send its information every 250 usec * N.
Being 15 the maximum number of Slaves, in the worst case each slave can send its information every 3.75 msec.
Each slave drive has the ability to send two 32 bits data of information. The Master drive can be set for the number of slaves of the drop and the slaves they need to answer.
Each slave with appropriate parameters can be configured to send informations to the master.
The Master drive receives all the answers from the Slaves and provides 32 system variables where through MDPlc application it is possible to read the information received from each slave .
The Master has 4 monitor parameters where it can be red the information received from the slaves . With an appropriate parameters can be selected the slave for which it is required to monitor the received data.
WEG_Softscope3 tool can be used to monitor 1 to 4 channels.

Even in the case of two ways (bi-directional) communication, there are two modes of operation:

Mode 1:
The bi-directional mode is handled in two steps. In the first step, the master send the data frame to the slave address who must answer. The data frame is repeated to all the slaves of the drop as for the one way mode.
In the second phase the interrogated slave send its information to the next slave in the drop . The data frame is repeated to all the slaves as for the one way mode. The master drive through the frame data is able to recognize who owns the data and collects in a reserved area the info of each drive slave.
On the master drive , using parameters you can select which information and which drive to show in the 4 parameters of the monitor.
On the Master , all answers of the various slaves are available through MDPlc system variables.

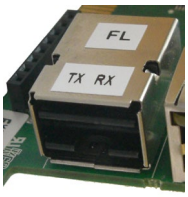
Mode 2 .
The bi-directional mode sends the information using forward communication from the master to all slaves in the drop and reverse communication from the last slave to the master . In both case the drive slaves are able to replace part of the data frame.

Typical Fast link applications are:

- Electrical line shaft
- Multi-motor systems.
- Helper system
- Droop control
- Physical Media used : Fiber Optics in a " daisy chain "
- Number of participants: 16 (1 master + 15 slaves)
- The Master can be transferred to the slave up to 8 parameters at 32 bits.
- Each slave is able to replace up to 4 parameters for the Slave Next
- Data Transmission : 250micros
- Task synchronization : from 125ms to 1ms , useful data are exchanged with the fast task and then to 1 msec , the task 125 is only used for synchronization.
- Maximum distance between nodes : 5m (with the use of fiber optic cable standard) .
- Each slave can be transferred to the master parameters 2 and 32-bit (only for Bi-directional).

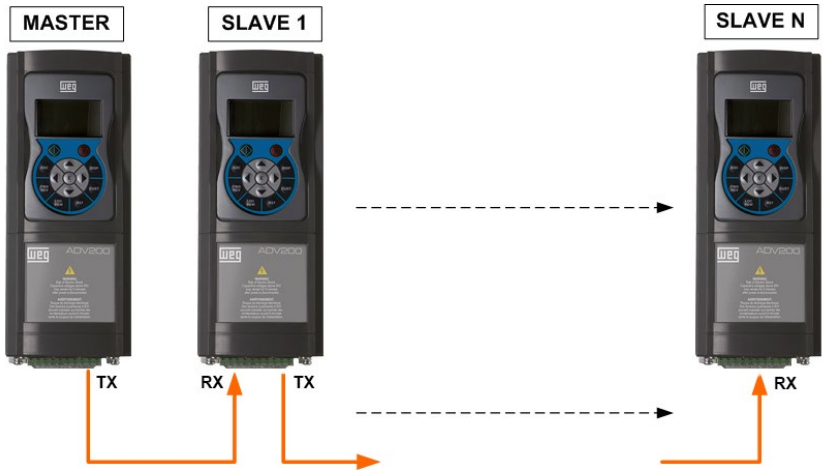
9.1 FastLink connector

FastLink communication (Connector XF0 = FL Fast Link) allows several drives to be linked to perform synchronisation process.



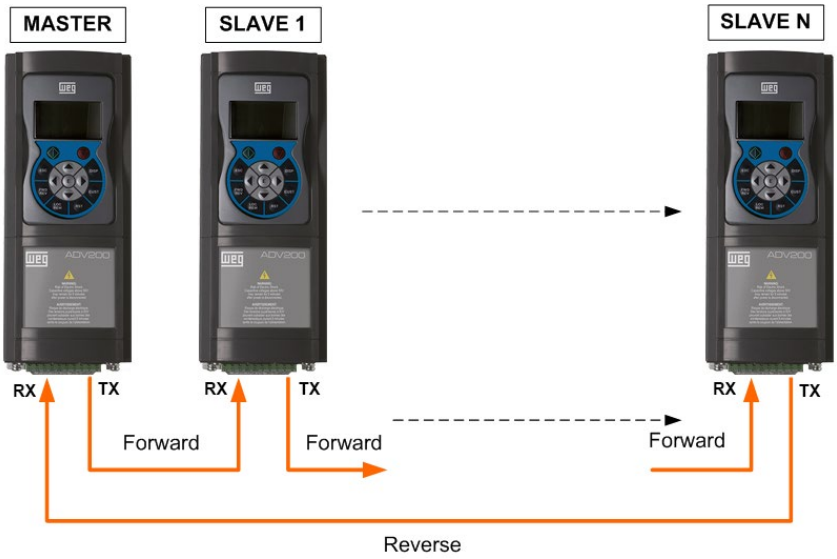
It is possible to link TPD32-EV + APC300 and/or ADV200 Drive up to 1 master and 15 Slaves.

Mono-directional (one way):



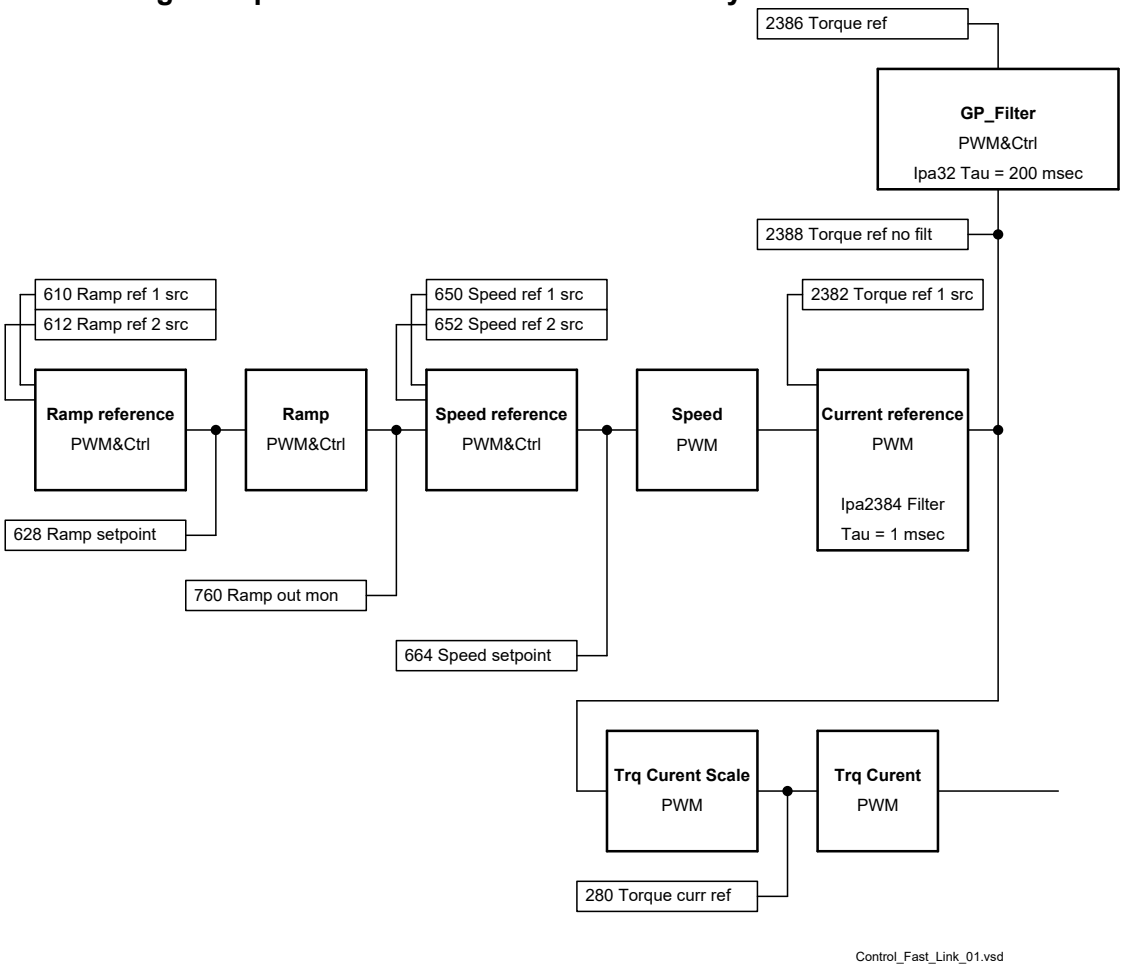
- 1 Master – 15 slaves
- Master transmit 8 parameter 32 bit
- Each Slave may replace up to 4 parameter for the following Slave

Bi-directional (two way)



- 1 Master – 15 slaves
- Each Communication cycle one Slave transmit 2 parameter 32 bit back to master
- 4 Programmable Slave Monitor channel on the Master in Basic FW
- 32 monitor channel on the master available in MDPLC.

Transferring the Speed Reference in a multi-motor system



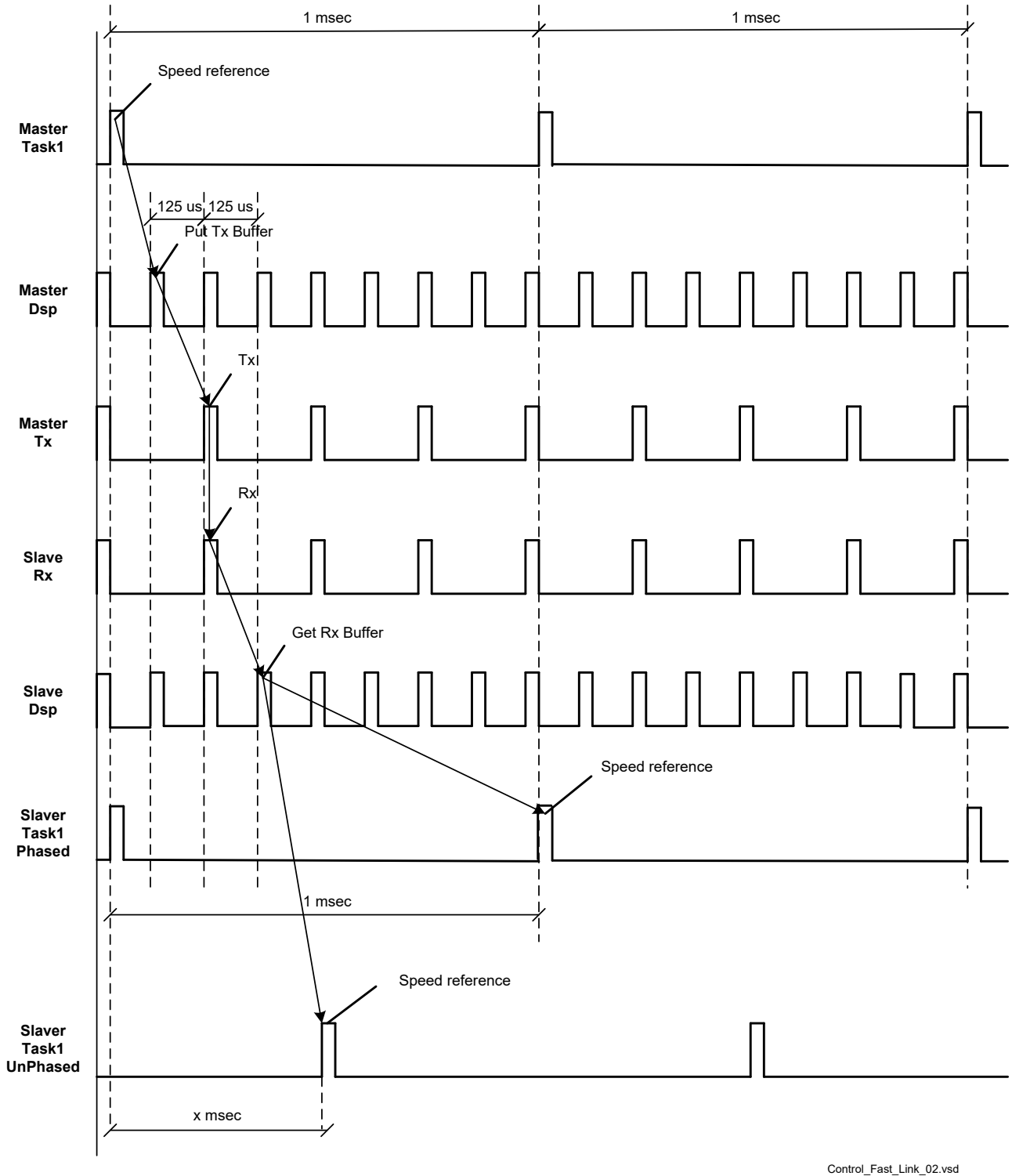
On a line with several motorised axes, the master drive receives a set of speeds on which it generates a ramp profile to obtain a speed reference.
The master then sends the speed reference to the slaves via the FastLink bus. Using standard drive functions, the slaves manipulate the speed reference obtained so as to calibrate the speed of the motor according to the mechanical characteristics of the axis being controlled.
On each slave it is also possible to define whether the data received from the master is to be used with a positive sign, by selecting “FL Fw N mon” from the selection lists, or a negative sign, by selecting “FL Fw N inv mon”.

This method of managing the speed reference is called "direct reference".
It is also possible to create a "reference cascade" so that each slave sends its current speed to the next after this has been "manipulated" with respect to that received from the master.
In the "reference cascade" system, the master sends the data frame to the first slave. The first slave takes all the data in the frame, replaces part of the data and then sends the frame to the next slave drive. The same sequence is repeated by all the slave drives.
For further details about replacing data frames, reference should be made to the ADV200 drive instruction manual.

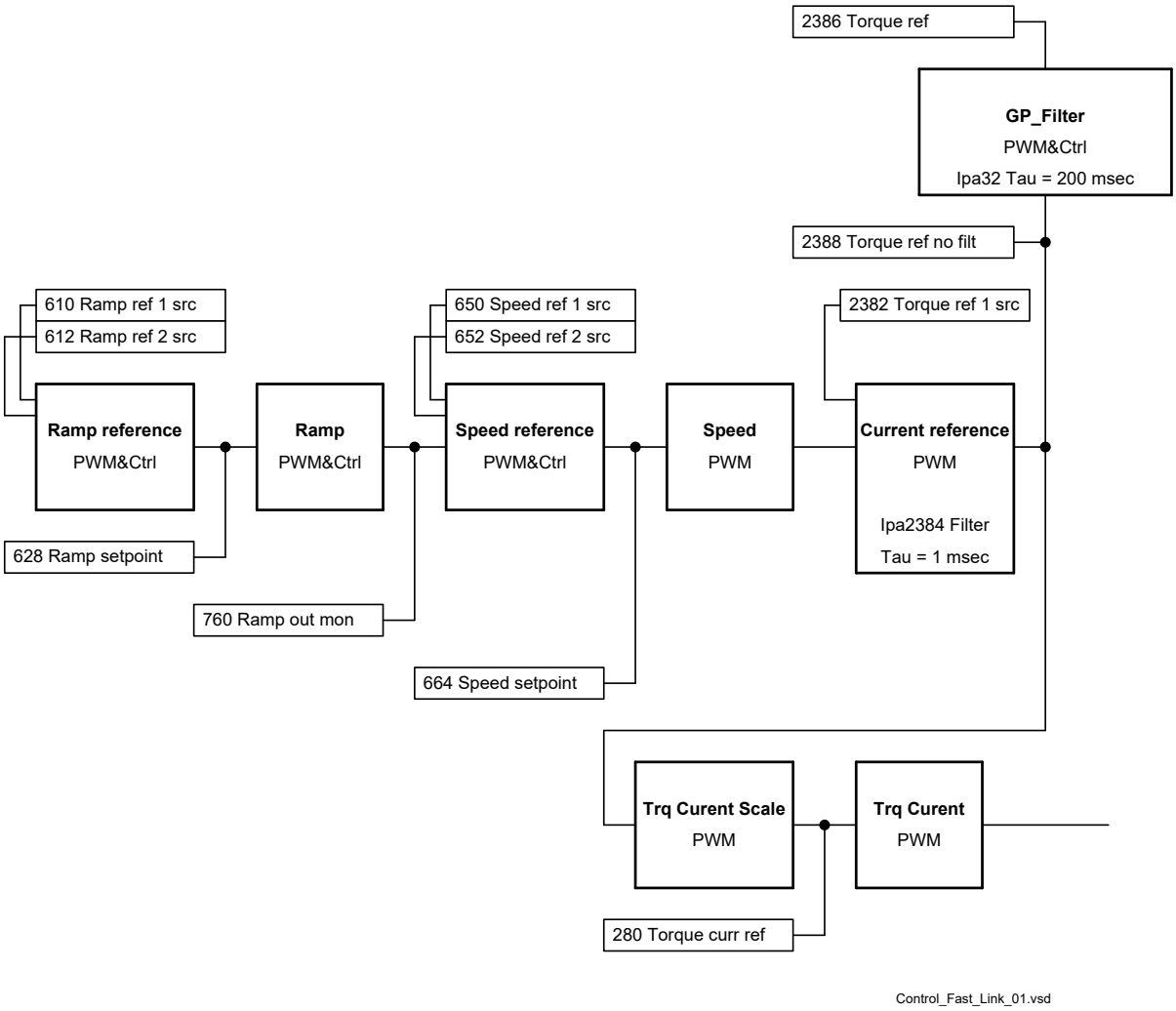
Parameter 5702 “FL sync slave type” can be used to define the type of synchronisation between the drives.
If the various tasks of the drives are synchronised, the speed reference generated by the master is managed by the slave with a repetitive and constant delay of 1 msec.
If just the PWM task is synchronised, the speed reference generated by the master is managed by the slave with a variable delay of between 250 micros and 1.250 msec. It is, however, important to

note that the delay depends on the activation of the tasks at drive start-up and that once the drives have been powered the delay is constant. The delay may then change the next time the drive is switched off and then restarted.

FastLink Mode = One way



Transfer of the Torque Reference between master and slave: Helper function



The Helper application is used when the inverters control one or motors mechanically linked to one another and the load must be distributed equally among them all.
The Helper function is also used to control motors with two or three windings (separate and isolated) via two or three inverters.
The master drive is speed-controlled and the slave drives are torque-controlled.
The ramp reference is sent to the master drive via analog input or fieldbus.
The master then sends the Torque Reference to the slaves via the FastLink bus.
The motors thus deliver the same torque and share the total load equally.

In some cases the mechanical configuration is such that the slave and master motors turn in opposite directions, which means the torque direction must also be inverted.
On each slave it is therefore possible to define whether the data received from the master is to be used with a positive sign, by selecting “FL Fw N mon” from the selection lists, or a negative sign, by selecting “FL Fw N inv mon”.

“FastLink fault”

If the EXP-FL-XCAN-ADV card is installed in the drive, all the FastLink communication fault signals are enabled and managed via generation of a *28 “FastLink fault ”* alarm, with different subcodes to indicate the cause of the error.
When the drive detects a FastLink fault, it prepares to trigger a “FastLink fault” alarm.
Use the “FL fault enable src” command to select whether to generate an alarm when a fault is detected.
This option is enabled in the default configuration.
The configuration of the “FL fault enable src” parameter can be changed to control the phases in which alarm generation is enabled.
For example, by connecting the “FL fault enable src” parameter to “Enable state mon” you can enable generation of the “FastLink fault” alarm in the phase when the drive is enabled.
In systems where drive power-off is not done simultaneously, some drives may detect a FastLink fault and generate a FastLink alarm.
This parameter can be used to disable the alarm at power-off by connecting the “FL fault enable src” parameter to “Enable state mon”.
When the drive detects a FastLink communication fault it maintains the last data frame received successfully.

For further details about FastLink alarm codes, reference should be made to the ADV200 drive instruction manual.

FastLink connection cable

FastLink communication cables are available with lengths of 1-2-3-5 meter

Updating times for the various functions

List of information available as FastLink outputs

IPA	Description	Update Time
6000	Null	Constant
6002	One	Constant
626	Ramp ref out mon	8 msec
628	Ramp setpoint	8 msec
760	Ramp out mon	8 msec
664	Speed setpoint	1 msec
260	Motor speed	125 micro sec
262	Motor speed nofilter	125 micro sec
2150	Encoder 1 speed	125 micro sec
5150	Encoder 2 speed	125 micro sec
250	Output current	125 micro sec
252	Output voltage	125 micro sec
254	Output frequency	125 micro sec
280	Torque current ref	125 micro sec
282	Magnet current ref	125 micro sec
284	Torque current	125 micro sec
286	Magnet current	125 micro sec
2360	Torque lim Pos Inuse	8 msec
2362	Torque lim Neg Inuse	8 msec
2386	Torque ref %	1 msec
2388	Torque ref nofilter	125 micro sec

270	DC link voltage	125 micro sec
2162	Encoder 1 position	125 micro sec
2154	E1 Virtual position	125 micro sec
2156	E1 Revolutions	125 micro sec
3006	Speed ratio out mon	1 msec
3070	Droop out mon	1 msec
852	Multi ref out mon	8 msec
870	Mpot setpoint	8 msec
894	Mpot output mon	8 msec
920	Jog output mon	8 msec
3104	Inertia comp mon	1 msec
1500	Analog input 1 mon	1 msec
1550	Analog input 2 mon	1 msec
1600	Analog input 1X mon	1 msec
1650	Analog input 2X mon	1 msec
368	Drive overload accum	8 msec
3212	Motor overload accum	8 msec
3260	Bres overload accum	8 msec
272	Heatsink temperature	8 msec
1060	Sequencer status	8 msec
4432	Word comp mon	1 msec
3446	Powerloss nextratio	1 msec
4372	DS402 status word	8 msec
4394	PFdrv status word 1	8 msec
4396	PFdrv status word 2	8 msec
4024	Fieldbus M->S1 mon	1 msec
4034	Fieldbus M->S2 mon	1 msec
4044	Fieldbus M->S3 mon	1 msec
4054	Fieldbus M->S4 mon	1 msec
4064	Fieldbus M->S5 mon	1 msec
4074	Fieldbus M->S6 mon	1 msec
4084	Fieldbus M->S7 mon	1 msec
4094	Fieldbus M->S8 mon	1 msec
4104	Fieldbus M->S9 mon	1 msec
4114	Fieldbus M->S10mon	1 msec
4124	Fieldbus M->S11mon	1 msec
4134	Fieldbus M->S12mon	1 msec
4144	Fieldbus M->S13mon	1 msec
4154	Fieldbus M->S14mon	1 msec
4164	Fieldbus M->S15mon	1 msec
4174	Fieldbus M->S16mon	1 msec
3700	Pad 1	1 or 8 msec
3702	Pad 2	1 or 8 msec
3704	Pad 3	1 or 8 msec
3706	Pad 4	1 or 8 msec
3708	Pad 5	1 or 8 msec
3710	Pad 6	1 or 8 msec
3712	Pad 7	1 or 8 msec
3714	Pad 8	1 or 8 msec
3716	Pad 9	1 or 8 msec
3718	Pad 10	1 or 8 msec
3720	Pad 11	1 or 8 msec
3722	Pad 12	1 or 8 msec

3724	Pad 13	1 or 8 msec
3726	Pad 14	1 or 8 msec
3728	Pad 15	1 or 8 msec
3730	Pad 16	1 or 8 msec
4770	First alarm	8 msec
4840	Alarm lo state	8 msec
4842	Alarm hi state	8 msec
1100	Digital input mon	1 msec
1200	Digital input X mon	1 msec
5008	Test gen out	8 msec
5750	FL Fw 1 mon	250 micro sec
5752	FL Fw 2 mon	250 micro sec
5754	FL Fw 3 mon	250 micro sec
5756	FL Fw 4 mon	250 micro sec
5758	FL Fw 5 mon	250 micro sec
5760	FL Fw 6 mon	250 micro sec
5762	FL Fw 7 mon	250 micro sec
5764	FL Fw 8 mon	250 micro sec

List of src where FastLink inputs can be connected

IPA	**Description**	**Update Time**
960	Set speed ref src	1 msec
3660	Compare input 1 src	8 msec
3662	Compare input 2 src	8 msec
4340	DS402 cw src	8 msec
4346	PFdrv cw 1 src	8 msec
4348	PFdrv cw 2 src	8 msec
5730	FL Fw 1 src	250 micro sec
5732	FL Fw 2 src	250 micro sec
5734	FL Fw 3 src	250 micro sec
5736	FL Fw 4 src	250 micro sec
610	Ramp ref 1 src	8 msec
612	Ramp ref 2 src	8 msec
614	Ramp ref 3 src	8 msec
650	Speed ref 1 src	1 msec
652	Speed ref 2 src	1 msec
832	Multi ref 0 src	8 msec
834	Multi ref 1 src	8 msec
2370	Torque lim neg src	125 micro sec
2358	Torque lim pos src	125 micro sec
2216	Gain adapt src	8 msec
2382	Torque ref 1 src	125 micro sec
2492	Vf scale src	1 msec
3002	Speed ratio src	1 msec
4452	Word decomp src	1 msec

Instruction Manual
Series: EXP-FL-XCAN-ADV
Revision: 3.0
Date: 6-12-2022
Code: 1S5F32

WEG Automation Europe S.r.l.
Via Giosuè Carducci, 24
21040 Gerenzano (VA) · Italy

www.weg.net

Driving efficiency and sustainability