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Addressing and identification procedure

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The are different procedures to address and identify a slave device in an EtherCAT network.

Auto increment address

The auto increment address is a topological address, i.e. the slave is addressed using a physical position in the network.

The master mainly uses the auto increment address when initializing the bus communication. The EtherCAT address (*"fixed physical address"*) is used for communication purposes as of the state *"Pre-Operational"*.

The auto increment address is 0 for the first slave after the master. The value is decremented for each further slave, i.e. the second slave has the address -1 (0xFFFF) and the third slave has the address -2 (0xFFFE).

For the communication, each slave increments the auto increment address in the EtherCAT telegram. The slave reading the value *"0"* in the telegram is addressed correspondingly.

EtherCAT address

The EtherCAT address is also called *"fixed physical address"* in the ETG specification. Synonyms of other vendors are for example *"Slave Address"* or *"Station Address"*.

Upon the bus initialization, the EtherCAT address is not saved in the slave devices, but it is assigned to each slave by the master. The assignment which EtherCAT address obtains a certain slave device takes place in the EtherCAT configuration either via the auto increment address or - for Hot Connect groups (flexible topologies) via an identification value.

The EtherCAT address 0 is reserved for the master. Slaves can have an address from 1 to 65535 (16 bits). EtherCAT addresses for slaves are often used starting from the value 1001.

Identification value

For Hot Connect groups (flexible topologies) or to exclude wiring errors, clearly identify slave devices irrespective of their topological position.

To always assign a specified EtherCAT address to a certain slave device, there are three different identification procedures. Which identification procedures are supported by a slave device (no support, one or more procedures are supported) is described in its device description or product documentation. The identification value is for example configured via the DIP switch or rotary switch at the slave device.

Identification procedure:

- (Configured) **Station alias**: The station alias is also often called *"Second Slave Address"* (SSA) or *"Second Station Address"*. The value can be retrieved from the ESC register 0x0012. It is generally configured via the EtherCAT configuration tool to which the identification value is written to the slave EEPROM. The EtherCAT slave controller then applies this value to its register upon restart.
- **Explicit Device Identification**: The slave informs on its identification value in the AL status code register (*"0x0134"*) upon master request. In the *"ETG.1020"*, this procedure is also called *"Requesting ID"*.
- **Data Word (/ Input Word)**: The identification value is located in a specified memory range of the EtherCAT slave (e.g. process data area from ADO 0x1000). For the address offset (ADO), refer to the device description (attribute

"IdentificationAdo") or set it if required. In the *"ETG.1020"*, this procedure is also called *"Direct ID"*.

Example

In the following example, the first two slaves (EtherCAT addresses 1001 and 1005) do not have any identification value, i.e. the EtherCAT address is only specified using the topology position (AutoInc address). If the physical order of these two devices is exchanged (identical device type), e.g. wiring error or intended device change, the EtherCAT address is still assigned to the respective position.

For the following two slaves (EtherCAT addresses 1042 and 1043), an identification procedure is configured, i.e. the master accepts the slaves in the cyclic communication only if the identification values (here 2 and 3) match the configured topology position (AutoInc address). Thus, there will be no wiring error between these two slaves. For an intended cross exchange or device exchange (spare device), the identification value has to be set accordingly.

Fig. 5: Example of an EtherCAT addressing