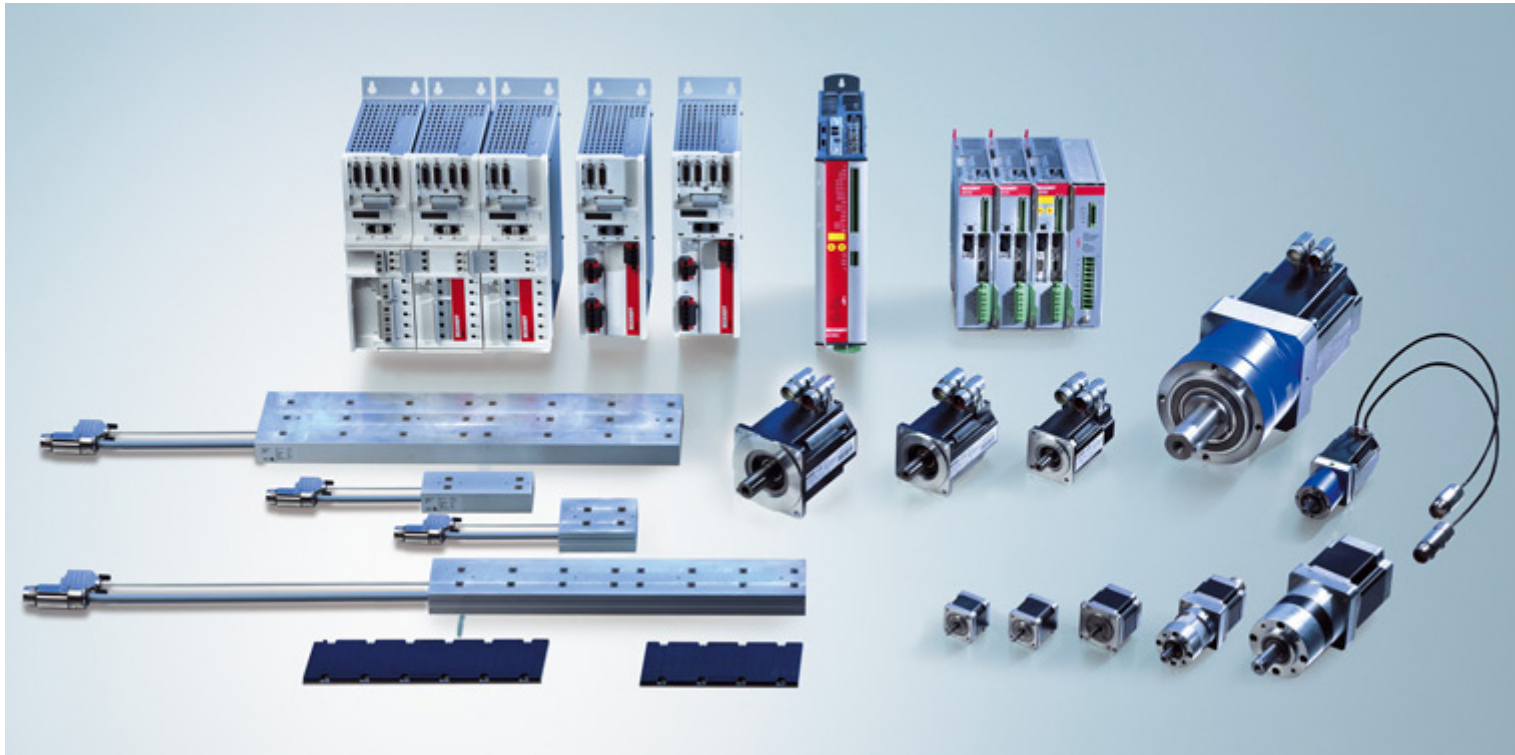


Anturit ja väylät



Aseman mittaus

- Resolver
- TTL encoder
- Sinus wave 1 Vpp
- EnDAT, single and multi turn
- Hiperface, single und multi turn
- BiSS, single und multi turn
- Magnetostrictive

“Standarddeja”

Encoder interface standard	Protocol owner	Physical interface	Interface speed	Supply voltage	Number of cable wires including supply
EnDat 2.2	HEIDENHAIN	RS-485	0.1-16MHz	3.6-14V	4+2
<u>BiSS</u>	IC-Haus GmbH ¹	RS-422	80kHz-10MHz	5V, 10-30V ³	4+2
HIPERFACE DSL	Sick	RS-485	9.375Mbaud	7-12V	2 or 2+2
SSI	Open ²	RS-422	Up to 2MHz	5V, 10-30V ³	4+2
EnDat 2.1	HEIDENHAIN	RS-485 and sin/cos (analog 1Vpp)	0.1-2MHz	3.6-5.25V	8+2
HIPERFACE	Sick	RS-485 and sin/cos (analog 1Vpp)	600-38400baud and 0-150KHz	7-12V	6+2
Sin/cos	N/A	Sin/cos (analog 1Vpp or 11μApp)	0-500kHz (typical), up to 10Mhz ⁴	Typically 5V	6+2
Incremental ABZ	N/A	TTL or HTL	0-1MHz (typical), up to 10Mhz ⁴	5V (TTL), 10-30V (HTL)	6+2 (or 3+2)

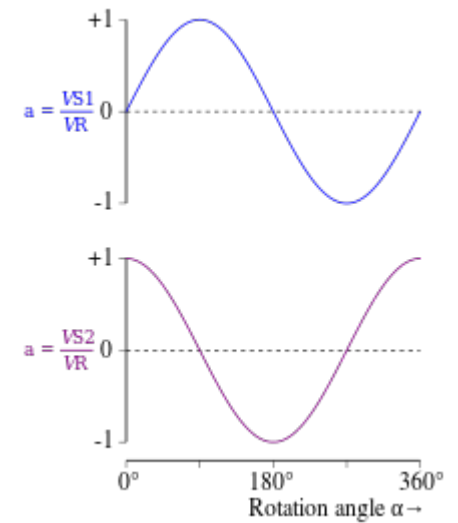
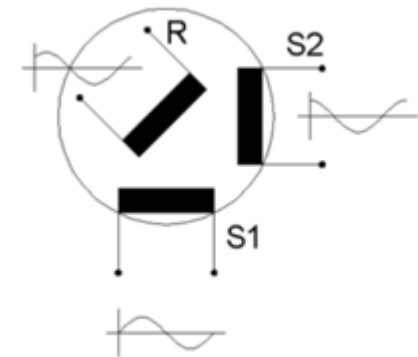
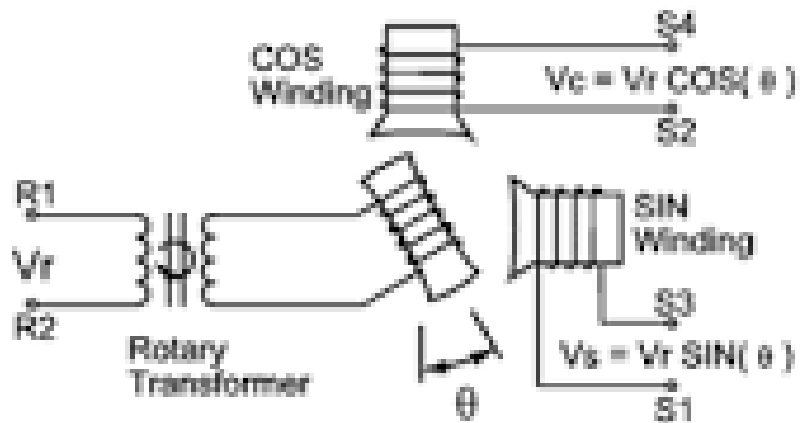
¹Open-source protocol, multiple encoder vendors

²Max Stegmann GmbH (Sick)

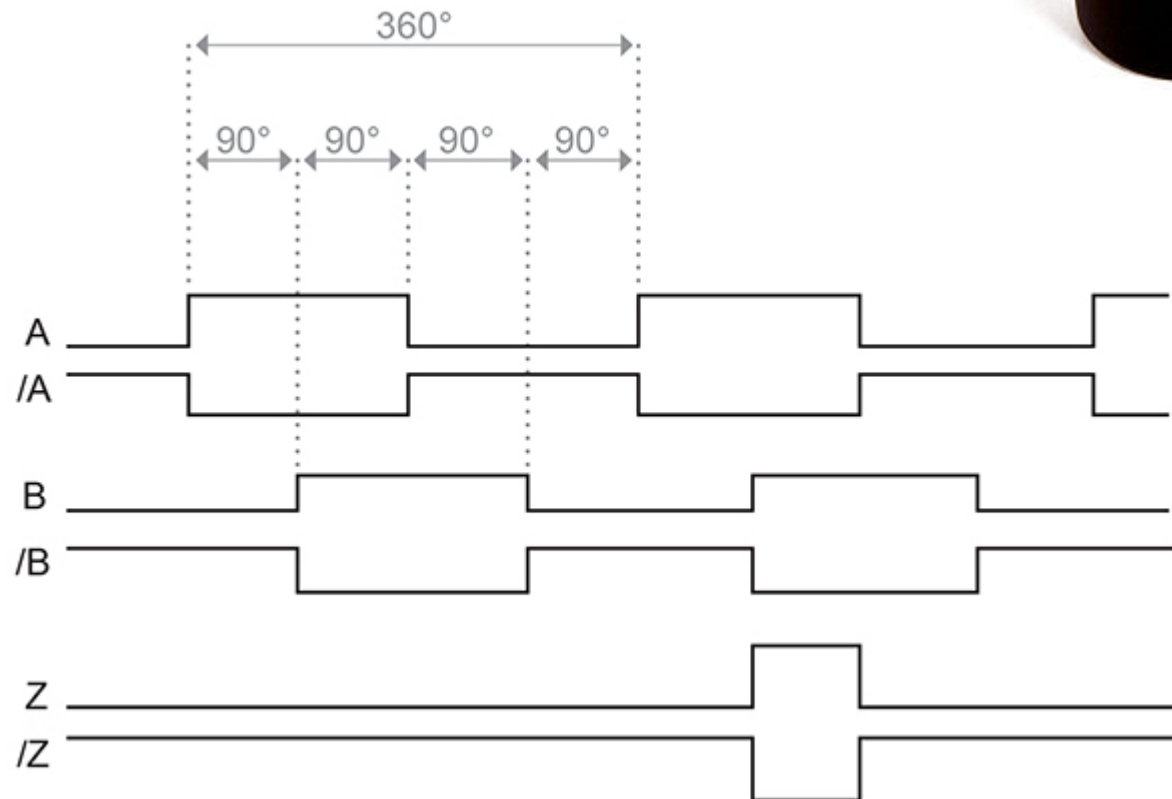
³Some vendors offer a 5-30V range

⁴Vendor-specific, depending on the encoder line count and maximum rotation speed

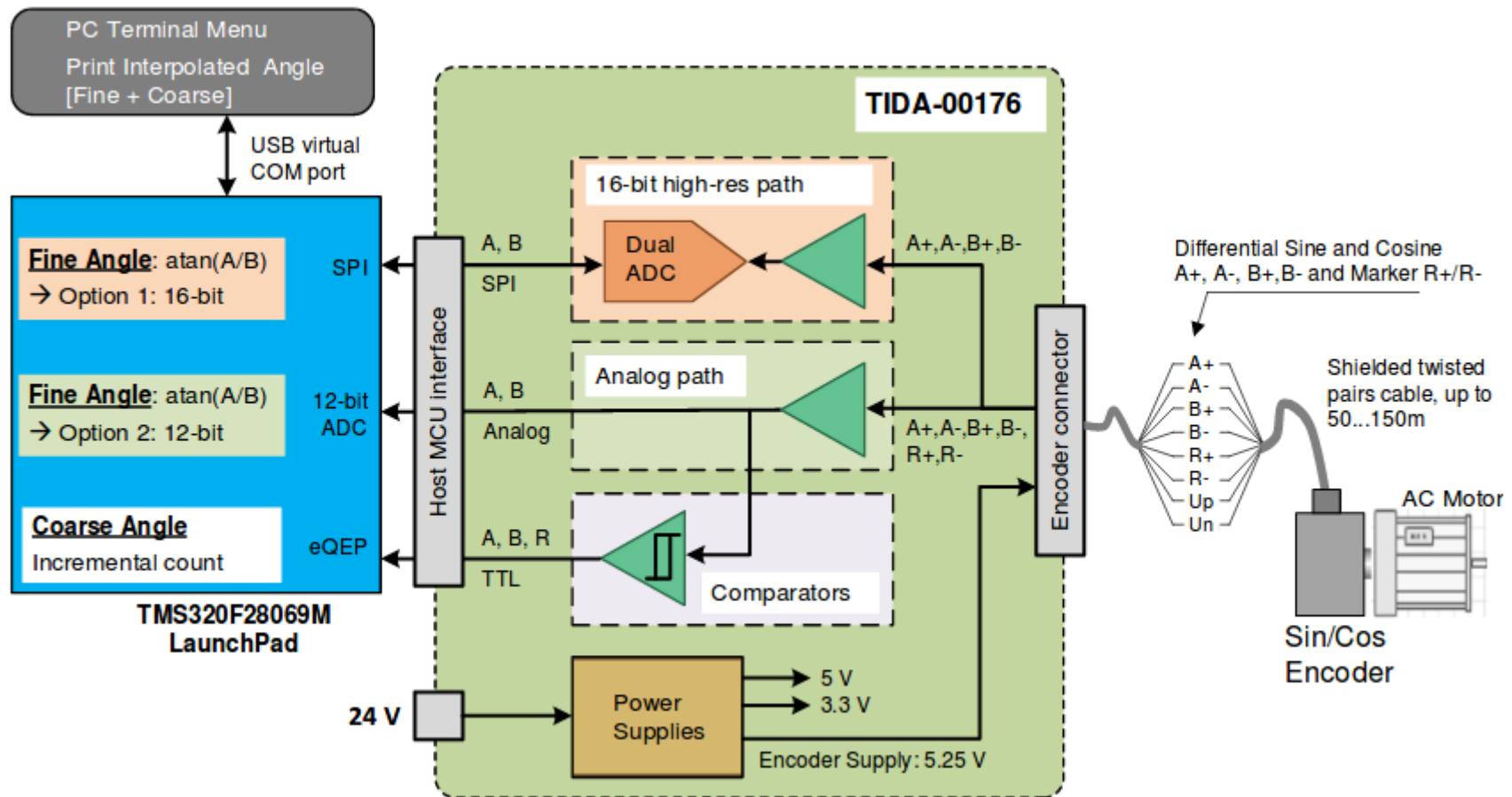
Resolveri



Pulssianturi



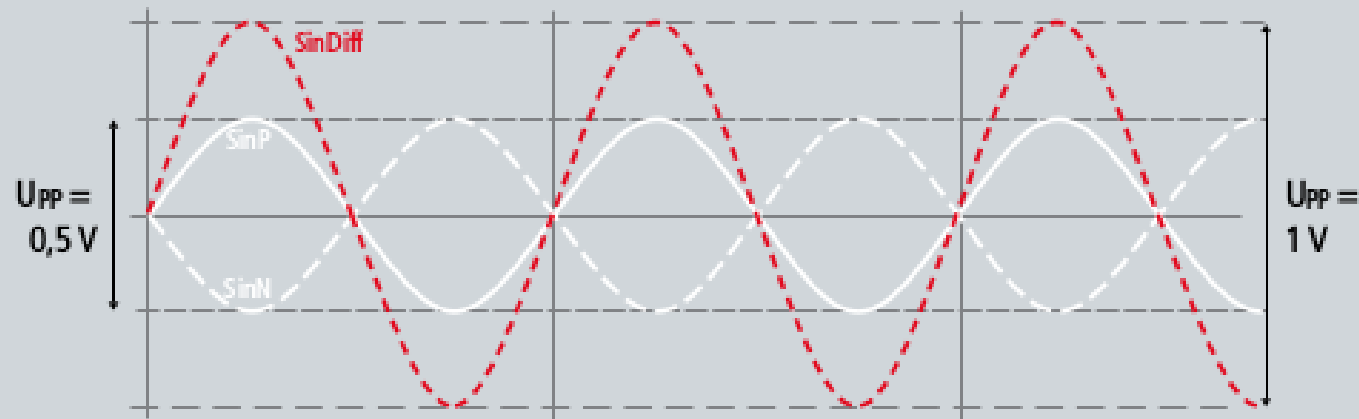
Sinus wave 1 Vpp



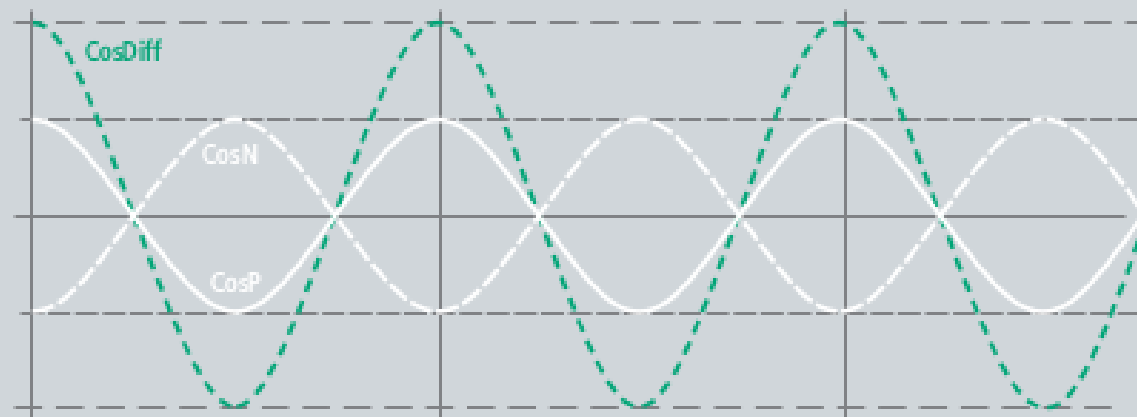
Sinus wave Vpp

Formation of the differential signal for avoiding interference

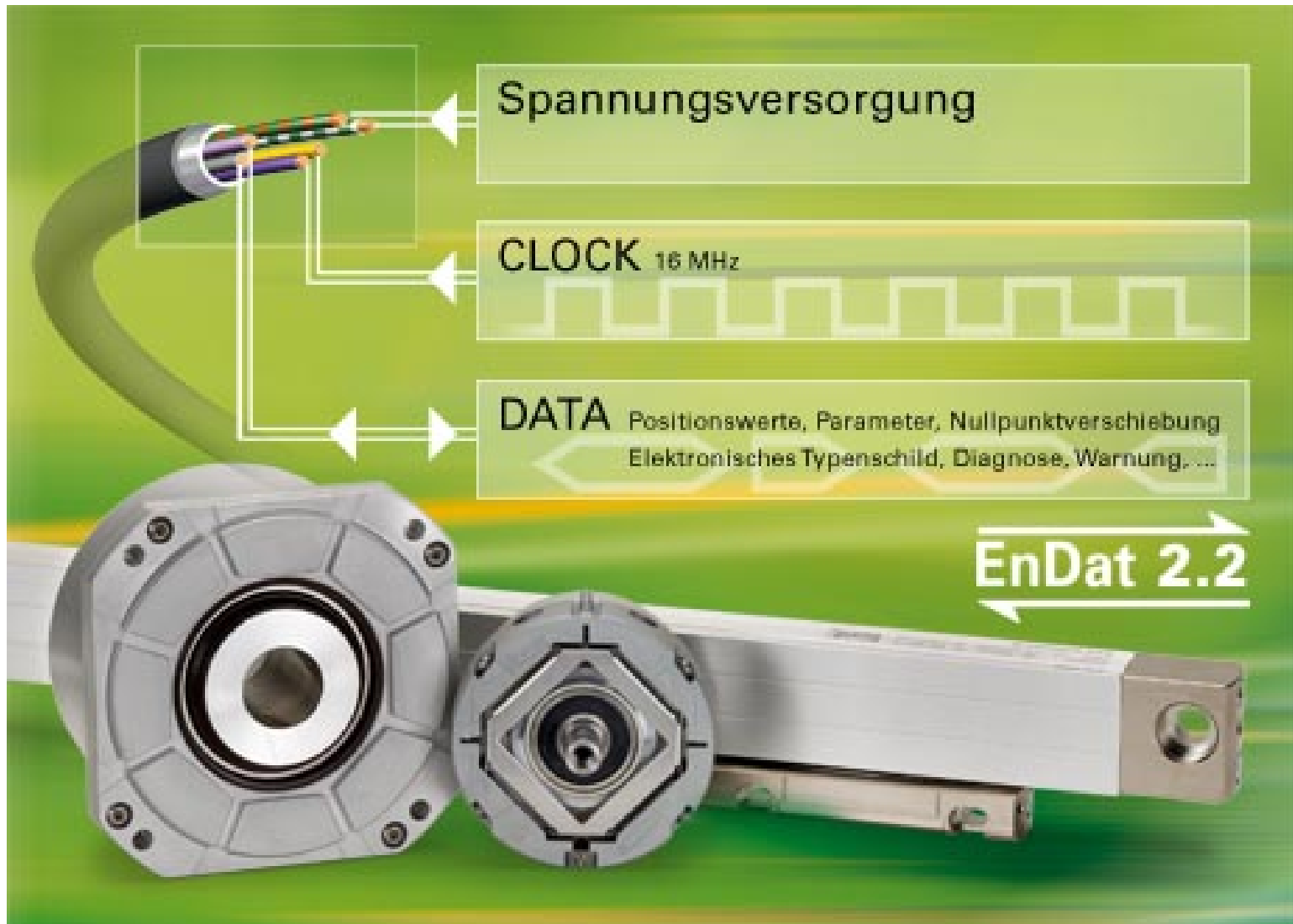
$$\text{SinDiff} = \text{SinP} - \text{SinN}$$



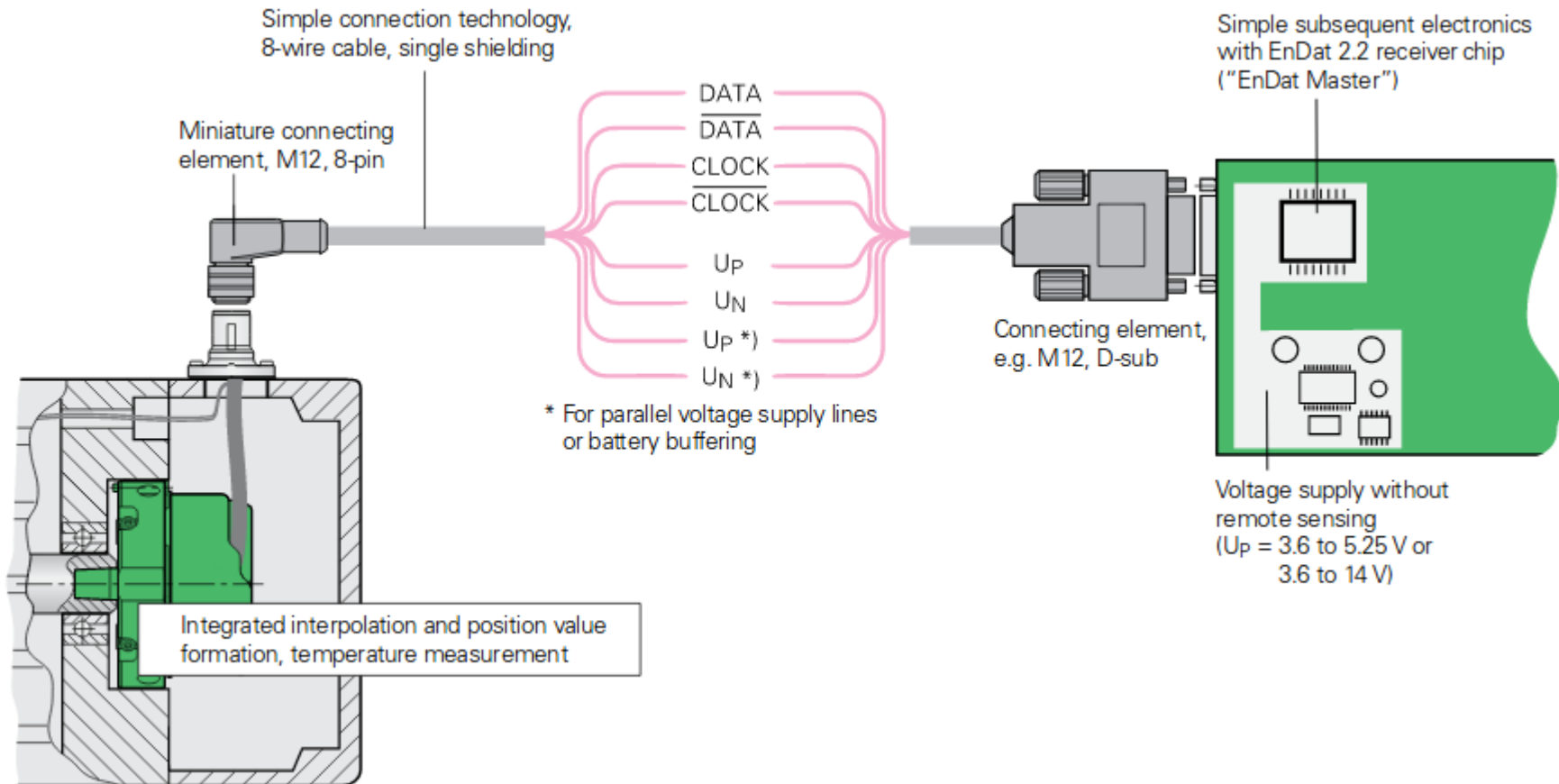
$$\text{CosDiff} = \text{CosP} - \text{CosN}$$



EnDat



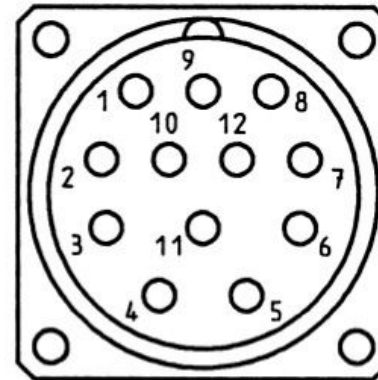
EnDat



Hiperface

7. Connection details SCS/SCM 70

PIN	Colour	Signal
1	black	REFCOS
2	grey	Data + RS 485
3	-	N.C.
4	-	N.C.
5	white	SIN
6	brown	REFSIN
7	green	Data- RS 485
8	pink	COS
9*	-	N.C./Screen
10	blue	GND
11	-	N.C.
12	red	Us 7 - 12 V



View on plug side

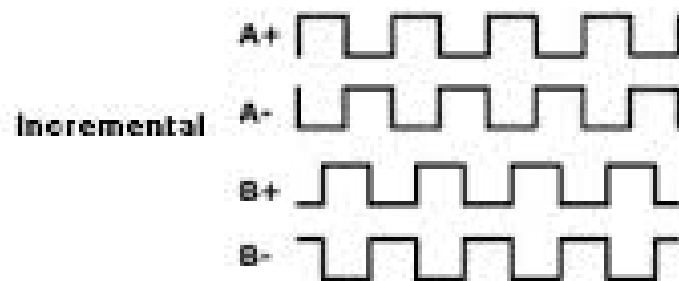
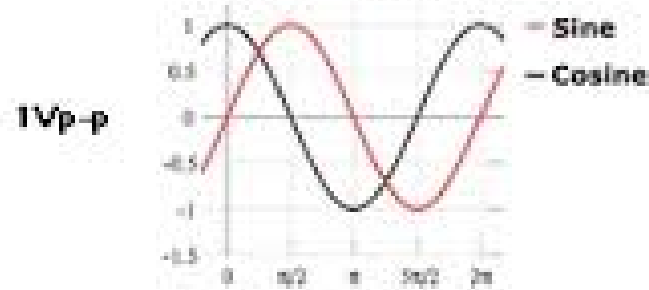
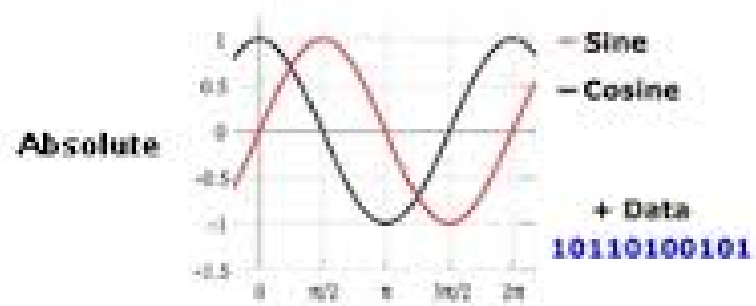
C12 FUR mating connector is not included in the scope of supply. Please order separately.

* Screen connection for flush-mounted version, PIN 9 to encoder housing.

Screen connection for surface-mounted version via connector housing to the internal housing.

N.C. = not connected

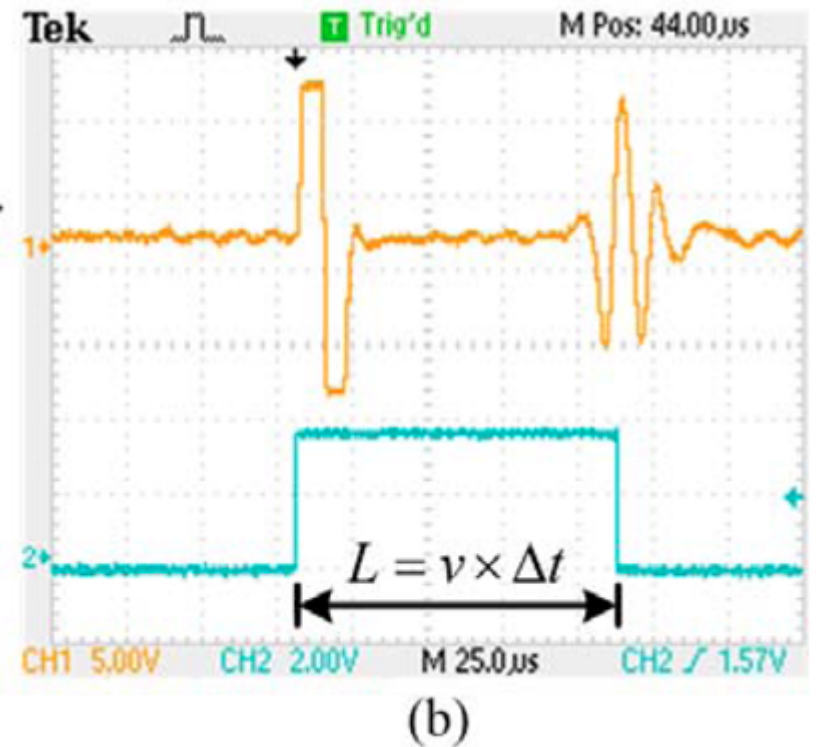
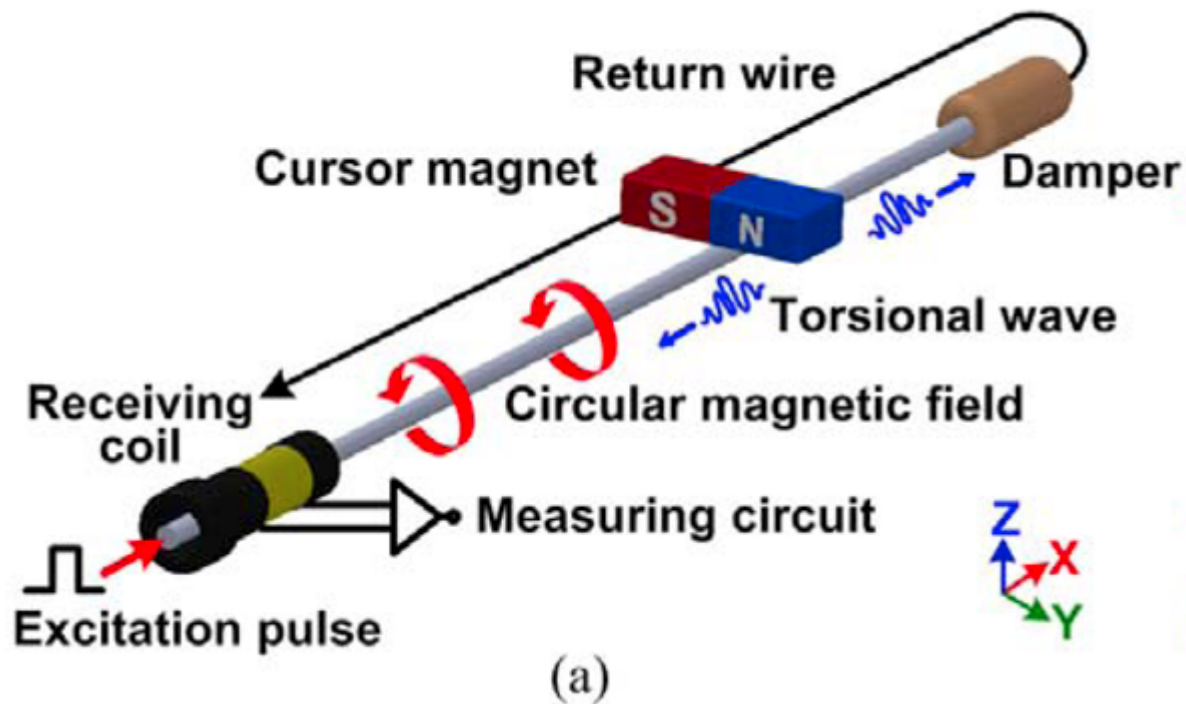
Hiperface



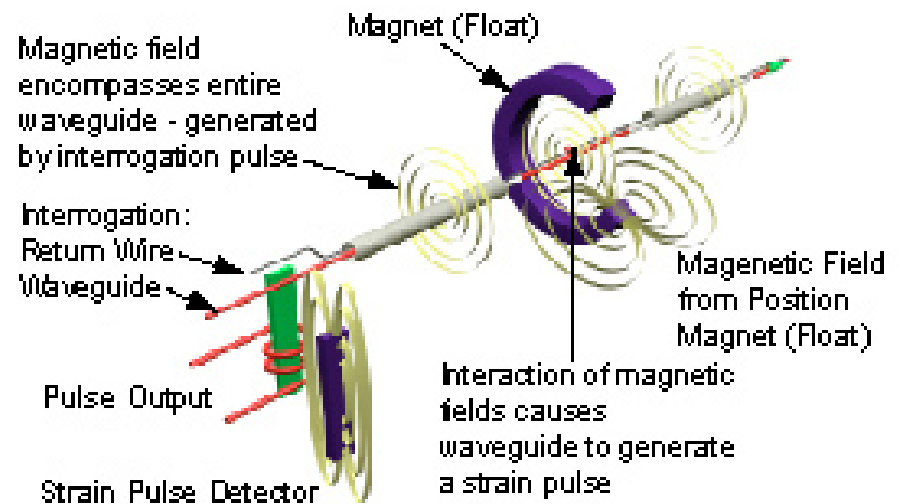
BiSS

- https://en.wikipedia.org/wiki/BiSS_interface

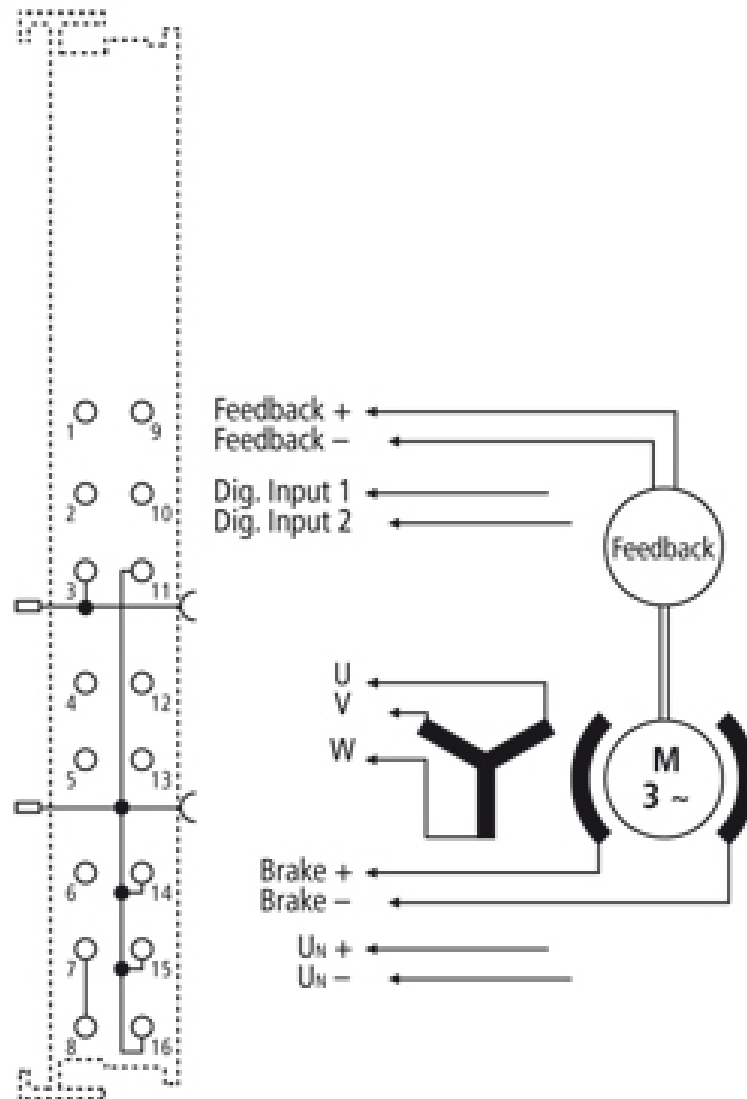
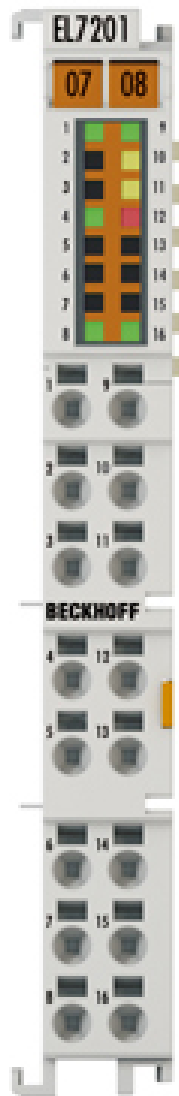
Magnetostrictive sensor



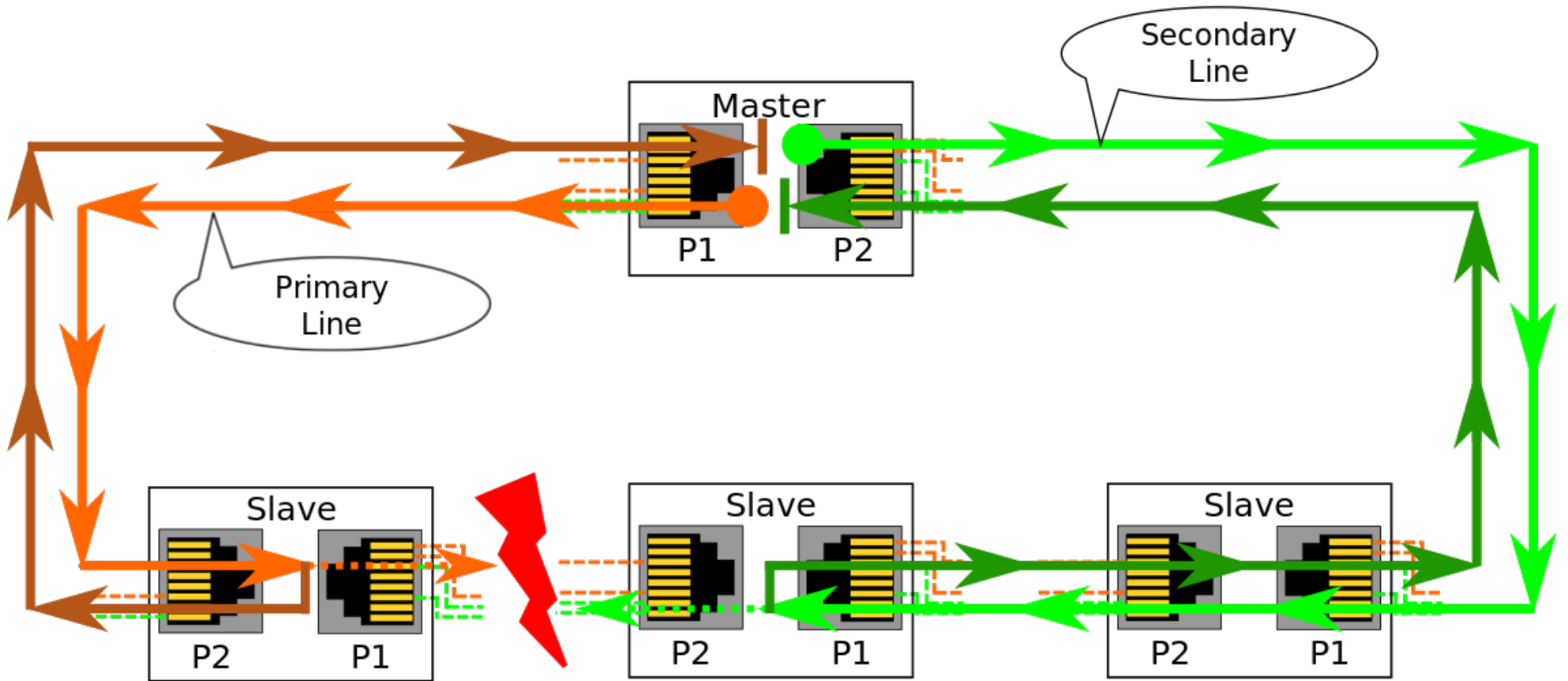
- <http://www.mtssensor.de/Magnetostriction.224.0.html>



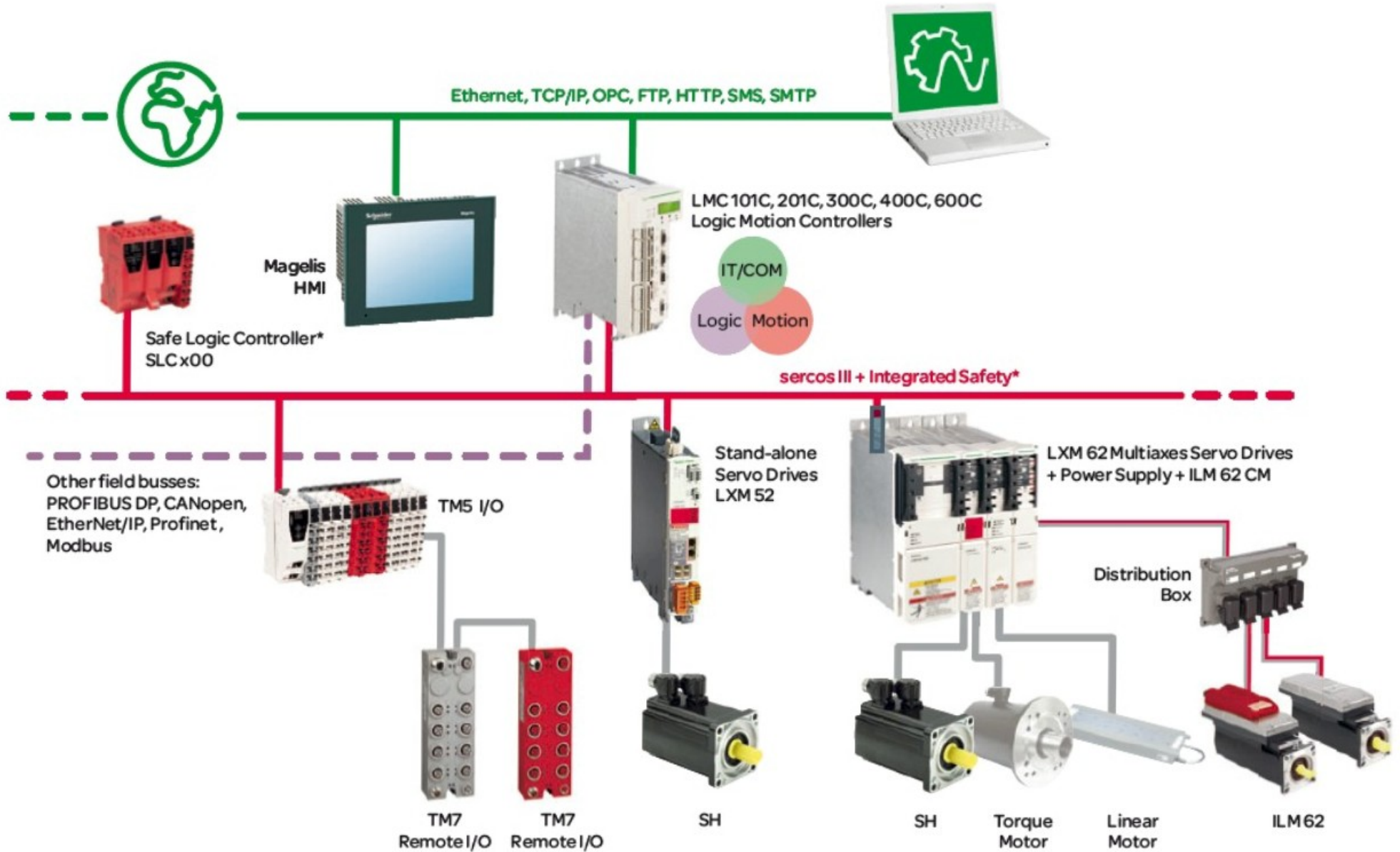
Liitäntä



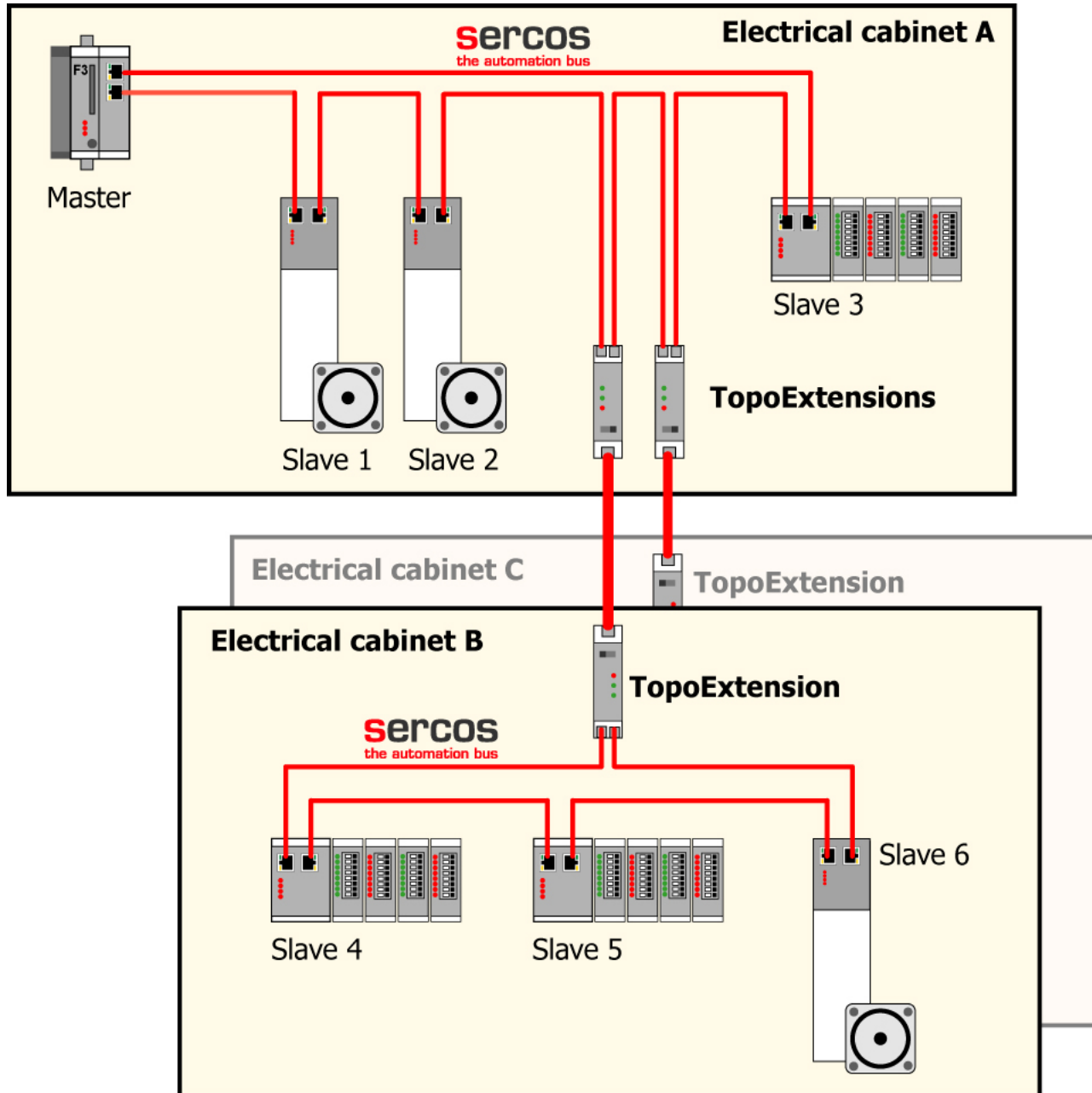
Sercos



Sercos



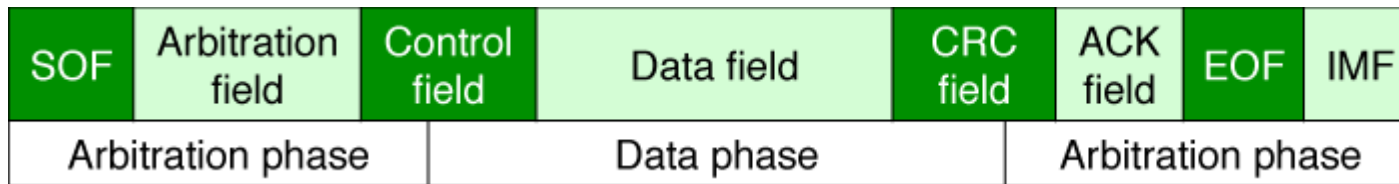
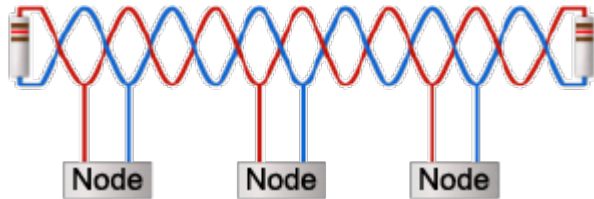
Sercos



Sercos

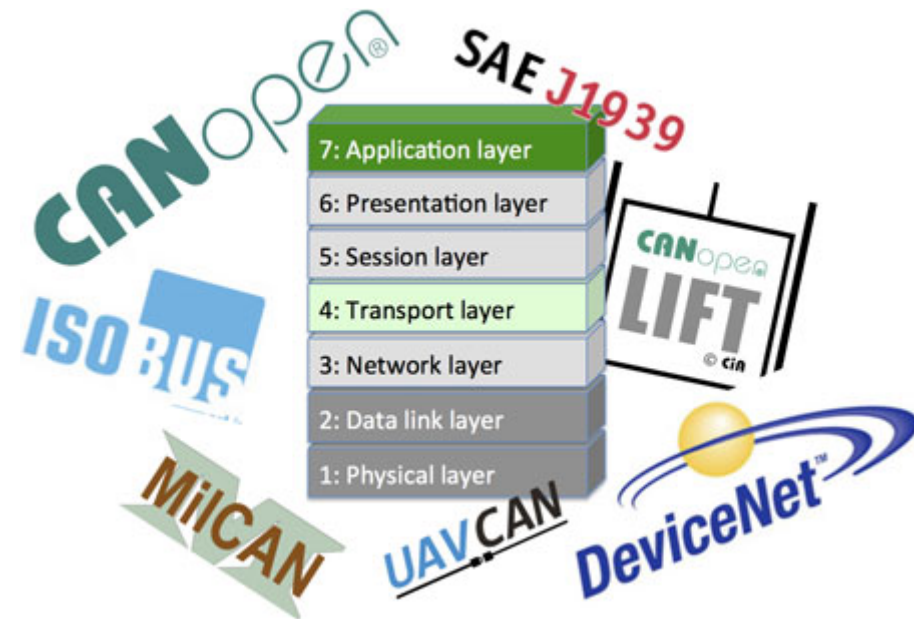
- Collision-free communication through the use of a time-slot mechanism.
- Highly efficient communication protocol (little overhead).
- Extremely low telegram jitter (specified at less than 1 microsecond, in practice as low as 35 nanoseconds).
- Highly developed standardized profiles agreed upon by multi-vendor technical working groups for dependable interoperability of devices from different manufacturers.
- Ability to control, for example, 60 axes of motion at an update of 250 microseconds for each and every drive (Sercos III).[5]

CAN



KEY
SOF = start-of-frame
CRC = cyclic redundancy check
ACK = acknowledgement
EOF = end-of-frame
IMF = intermission field

<https://www.can-cia.org/can-knowledge/can/can-data-link-layers/>

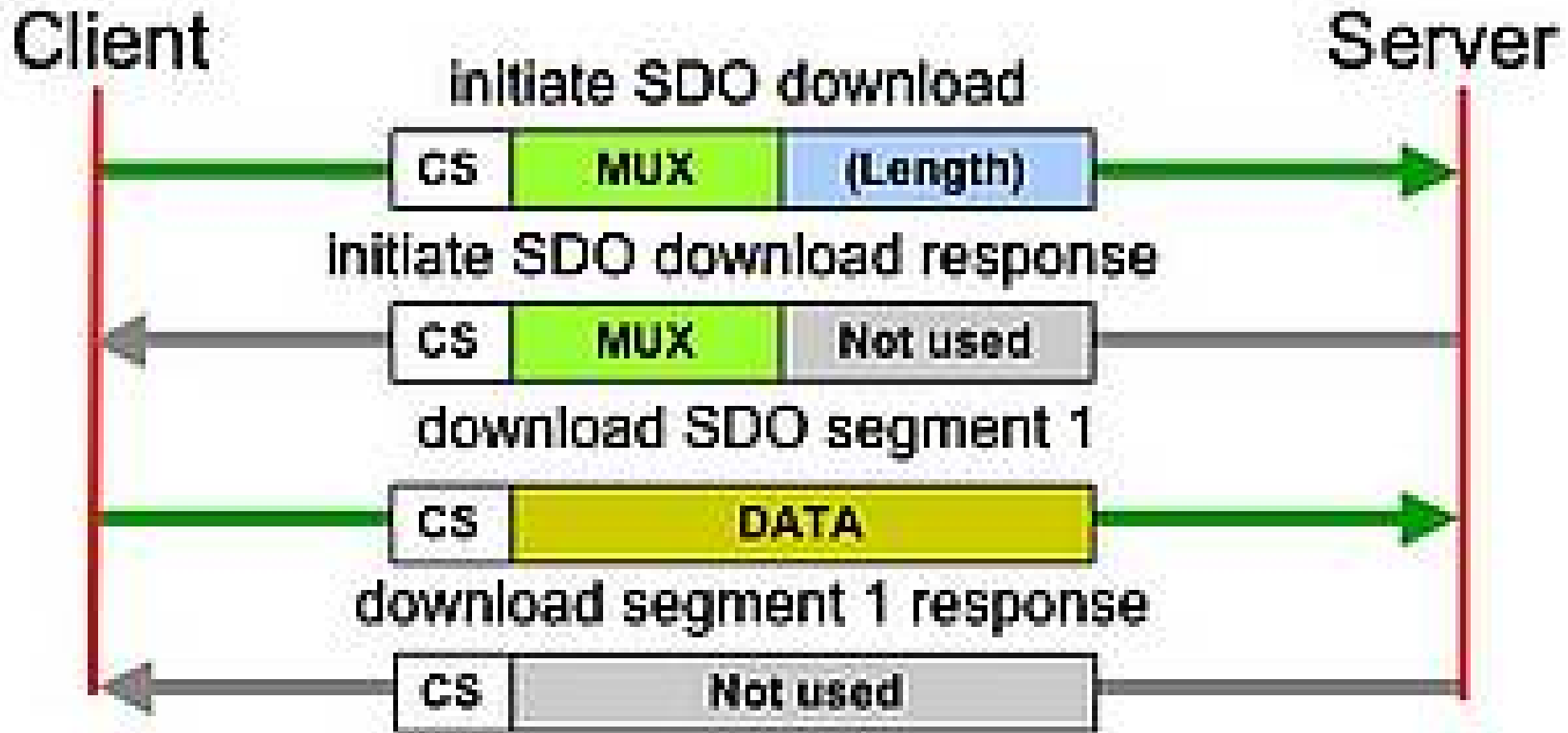


CANopen

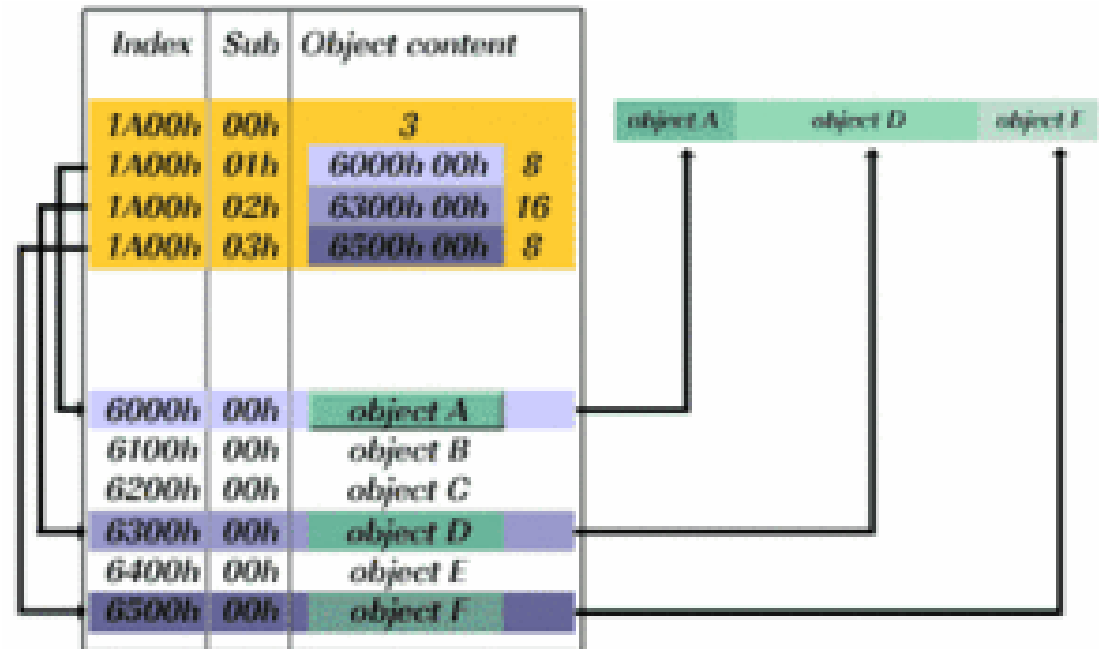
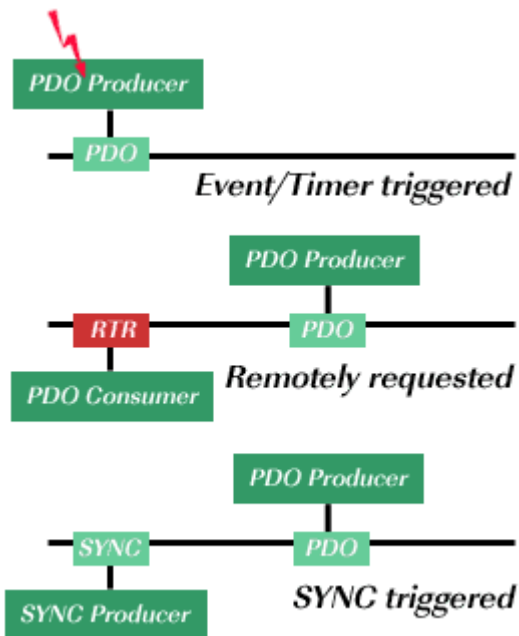
The CANopen protocols comprise:

- SDO protocol
- PDO protocol
- NMT protocol
- Special function protocols
- Error control protocols

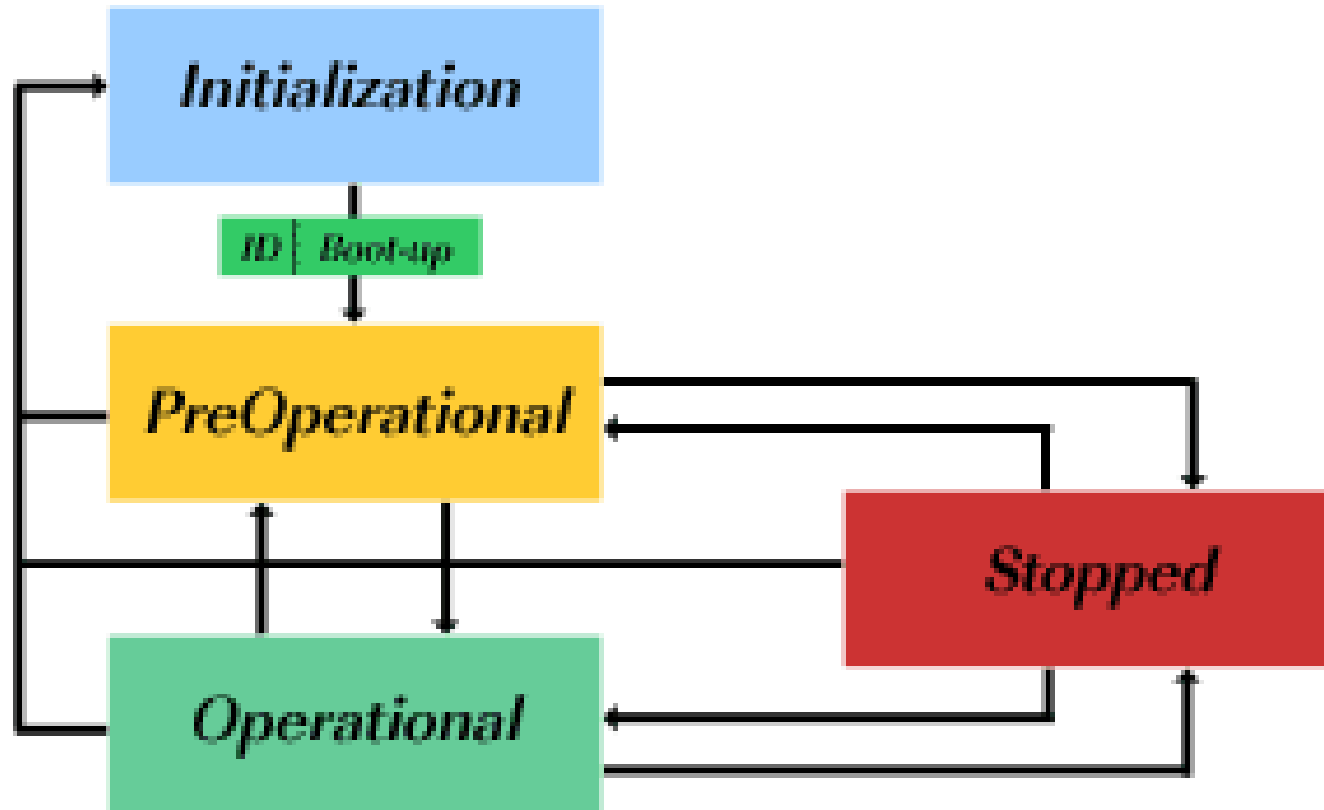
CANopen, SDO



CANopen, PDO

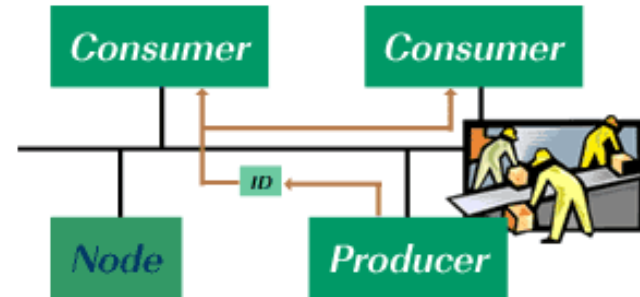


CANopen, NMT

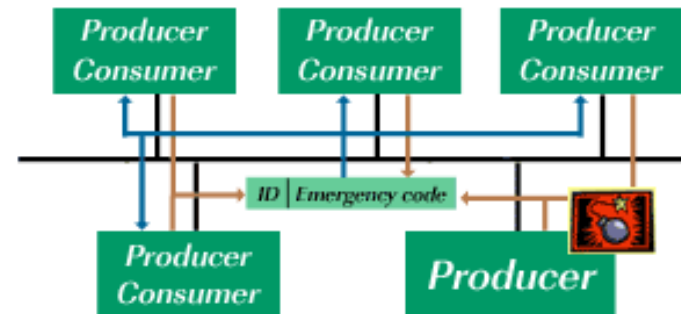


CANopen, Special function protocols

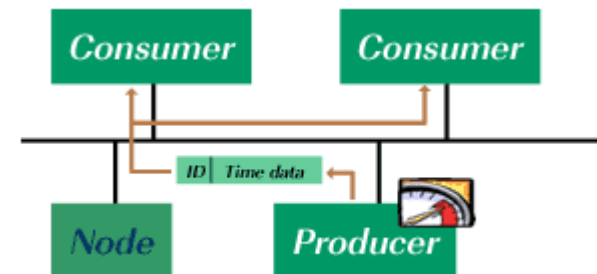
Synchronisation (SNYC) protocol



Emergency protocol



Time-stamp protocol



CANopen, Error control protocols



Heartbeat protocol

The Heartbeat protocol is a cyclically transmitted message that informs all heartbeat consumers of the availability of the heartbeat producer. In addition to the availability of the heartbeat producer, the heartbeat protocol provides the current NMT FSA state of the heartbeat producer. The cycle time for transmitting the Heartbeat message is configurable in the object dictionary index 1017h.

Boot-up protocol

The boot-up protocol represents a special type of an error control protocol. It is transmitted as the final action in NMT FSA state Initialisation, prior to enter the NMT FSA state Pre-operational. The reception of this message indicates that a new device has been registered to the CANopen network. The unintended reception of such a protocol during runtime either indicates a change in the network setup (e.g. due to the addition of a new CANopen device) or is considered a sign for an error condition (e.g. erroneous power supply of related CANopen device). The protocol uses the same identifier as any other error control protocol, such as e.g. the heartbeat protocol. The 1-byte data field has a fixed value of zero.

CANope device profiles

CiA 406: Profile for encoders

- CiA 420 Profiles for extruder downstream devices
- CiA 417 Profile for lift control systems
- CiA 458: Profile for energy measurements
- CiA 402 Profile for drives and motion control
- CiA 404: Profile for measuring devices and closed-loop controllers
- CiA 461 Profile for weighing devices
- CiA 410: Profile for inclinometer
- CiA 444: Profiles for container-handling machine add-on devices
- CiA 413: Profile for truck gateways
- CiA 462: Profile for item detection devices
- CiA 434: Profile for laboratory automation systems
- CiA 450: Profile for pumps
- CiA 445: Profile for RFID devices
- CiA 408: Profile for hydraulic devices
- CiA 446: Profile for AS-Interface gateways
- CiA 412: Profiles for medical devices

CANopen Application profiles

CiA 443: CANopen profile for SIIIS level-2 devices

- CiA 422 series: CANopen application profile for municipal vehicles
- CiA 415: CANopen sensor profile for mobile machines
- CiA 436 series: CANopen application profile for construction machines
- CiA 416 series: CANopen application profile for building door control
- CiA 425 series: CANopen application profile for medical diagnostic add-on modules
- CiA 447 series: CANopen application profile for special-purpose car add-on devices
- CiA 437: CANopen application profile for grid-based photo voltaic systems