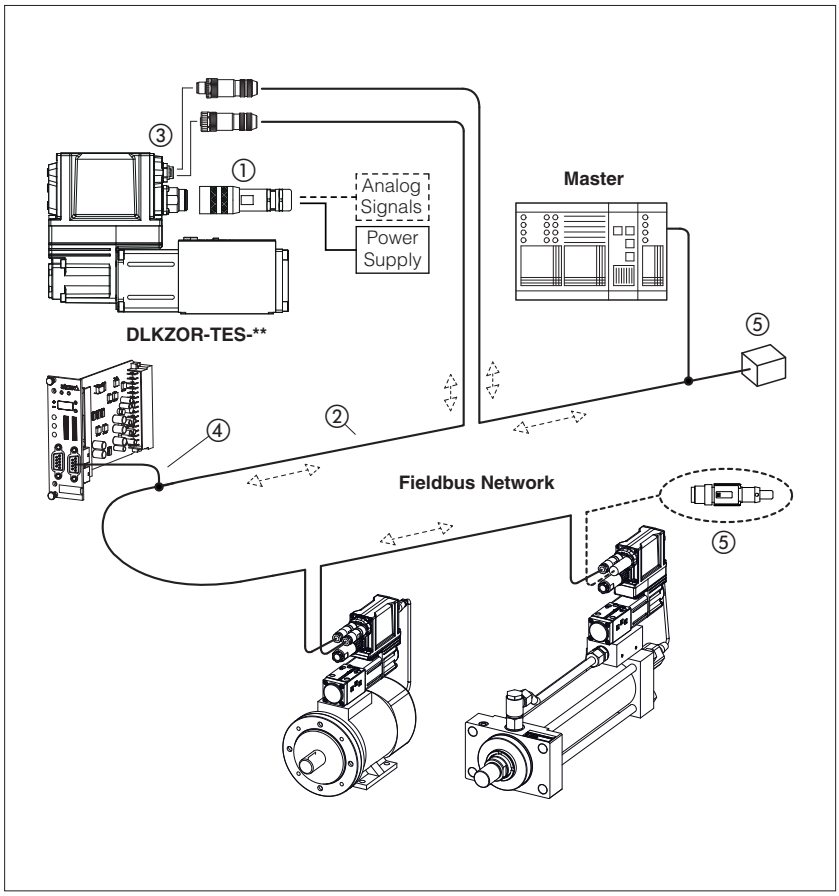
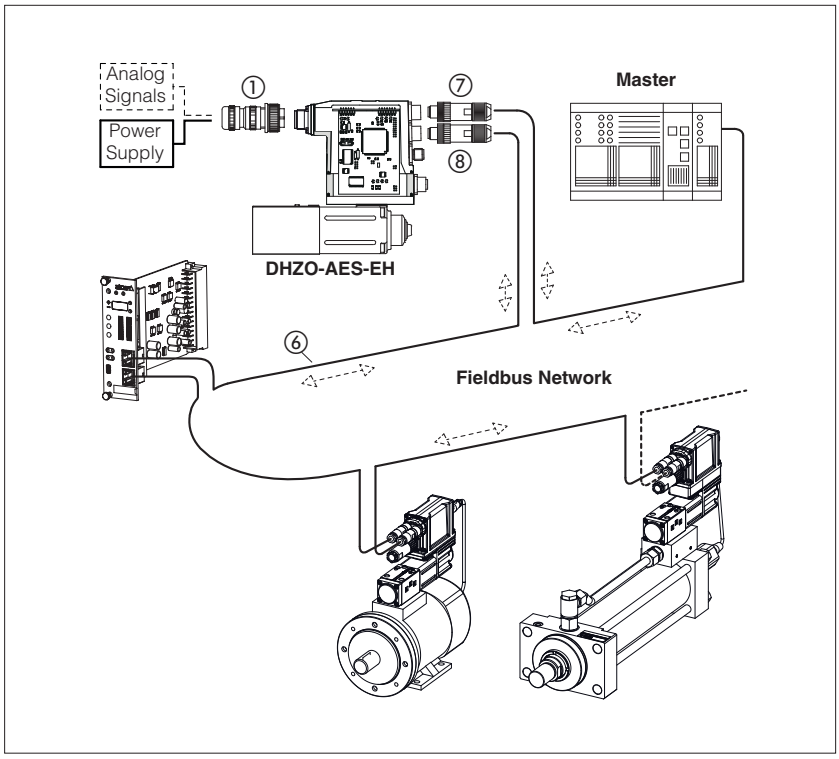
Fieldbus

BC (CANopen), BP (PROFIBUS DP) or EH (EtherCAT)

Typical CANopen or PROFIBUS DP fieldbus network



Typical EtherCAT fieldbus network



Fieldbus communication interfaces are available for digital proportional drivers and controllers.

Fieldbus communication interface allows a direct connection to machine's communication network, thus granting several plus:

- more information available for machine operation to enhance its performances
- improved accuracy and robustness of digital transmitted information
- costs reduction due to simpler and standardized wiring solutions
- costs reduction due to fast and simple installation and maintenance
- direct integration into machine's communication networks

These executions allow to operate proportional valves and pumps through fieldbus or using the analog signals available on main connector ①.

Fieldbus distributed-control

Fieldbus communication allows to share all the available information of the digital drivers and controllers (internal parameters, monitor and reference signals).

This distributed-control design allows to implement new and powerful machines functionalities for tuning, diagnostic, maintenance, etc.

The exchanged data, transmitted over the common communication cable, are available for all the other connected devices.

CANopen and PROFIBUS DP structure

CANopen and PROFIBUS DP networks consist of a common cable (2 twisted wire, ②) for digital communication: several devices (node ③) can be connected to this main cable by means of short cable branches ④.

The two endpoints of the main cable must be terminated with specific devices (terminator, ⑤) to dissipate or absorb the communication signal's energy thus preventing interferences and degradations of fieldbus transmission.

EtherCAT structure

EtherCAT network consist in a Ethernet common cable (4 twisted wire, ⑥) for digital communication. All EtherCAT slave devices have always the double connector for signal input ⑦ and signal output ⑧.

The main Ethernet cable starting from the EtherCAT Master, has to be connected to the slave input connector. The slave output connector has to be connected to the next slave input connector.

1 CANopen features for digital drivers and controllers in BC execution

Physical

Serial input format	Industrial field-bus with optical insulation type CAN-Bus ISO11898
Transmission rate	Transmission rates from 10 Kbit/s to 1 Mbit/s
Max node	32 per segment without repeater; 127 per segment with repeater

Communication Protocol

Data Link Layer	DS301 V4.2.0 - based on CAN standard frame with 11-bit identifier
Device Profile	DS408 - Fluid Power Technology (EN50325-4)
Device type	Slave

Startup and configuration (as per DS301+DSP305)

Boot up process	Minimum boot-up
Node setting	LSS (Layer Setting Services) SDO dip-switches (only for TERS, AERS) E(Z)-SW-BC programming software
Baudrate setting	LSS (Layer Setting Services), SDO
Baudrate	10 and 20 (only for AES driver) / 50 (default) / 125 / 250 / 500 / 800 and 1000Kbit/s

Fieldbus communication diagnostic (as per DS301)

Device Error	Emergency
Network Error	Node Guarding Heartbeat

Real-time communication (as per DS301 + DS408)

RPDO	Four mappable PDOs to the drivers:	AES, TES, LES, TERS, AERS, PES
	Four mappable PDOs to the controllers:	TEZ, LEZ
TPDO	Four mappable PDOs from the drivers:	AES, TES, LES, TERS, AERS, PES
	Four mappable PDOs from the controllers:	TEZ, LEZ
R(T)PDO types	Event Triggered, Remotely requested, Sync(cyclic) and Sync(acyclic)	

Non real-time communication (as per DS301 + DS408)

SDO	One SDO (1 Server + 1 Client)

Standard references

ISO 11898

Road Vehicles – Interchange of digital information controller area network (CAN) for High-speed communication

EN50325-4

Industrial communication subsystem based on ISO 11898 (CAN) for controller device interfaces

CiA DS301

CANopen – Application Layer and Communication Profile for Industrial Systems

CiA DR303-1

Cabling and connector pin assignment

CiA DSP305

CANopen – Layer Setting Services and Protocol

CiA DS408

CANopen – Device Profile for Proportional Hydraulic Valves v 1.5.2

Programming interface

E(Z)-SW-BC PC software using USB cable/adapter (see tech table **GS500**) or CANopen master device

Configuration file

EDS (Electronic Device Data Sheet), enclosed in programming software DVD E(Z)-SW-BC

Manual

E(Z)-MAN-S-BC and QUICKSTART-BC, enclosed in programming software DVD E(Z)-SW-BC

2 PROFIBUS DP features for digital drivers and controllers in BP execution

Physical

Serial input format	Industrial field-bus with optical insulation type PROFIBUS-DP RS485 European fieldbus standard (lev.1 – EN50170-part 2)
Transmission rate	Transmission rates from 9,6 Kbit/s to 12 Mbit/s
Max node	32 per segment without repeater; 126 node with repeater

Communication Protocol

Data Link Layer	PROFIBUS DPV0 - IEC 61158 (type 3)
Device Profile	PROFIBUS-DP Profile for Fluid Power Technology
Device type	Slave

Startup and configuration

Boot up process	SAP 61 for sending parameter setting data SAP 62 for checking configuration data
Node setting	SAP 55 dip-switches (only for TERS, AERS, KZ) E(Z)-SW-BP programming software
Baudrate setting	Automatic
Baudrate	9,6 / 19,2 / 45,45 / 93,75 / 187,5 / 500 / 1500 / 3000 / 6000 / 12000 Kbit/s

Fieldbus communication diagnostic

Device error	SAP 60

Real-time communication

PZD	Process data area of PPO telegram by Data Exchange, default SAP: cyclic transmission of standard Profibus frame *Drivers and controllers series 31 or lower* PPO type 3 for: AES, TES, LES, TERS, AERS PPO type 5 for: TES, LES, PES with S option PPO type 1, 101, 103 for: TEZ, LEZ, KZ *Drivers and controllers series 40 or higher* PPO type 3, 113, 213, 230 for: TES, LES PPO type 5, 115, 214, 240 for: TES, LES, PES with S option PPO type 1, 101, 103, 111, 121, 123, 223, 227 for: TEZ, LEZ
Cyclic mode	standard, sync and freeze

Non real-time communication

PKW	Parameter data area of PPO telegram by Data Exchange, default SAP: acyclic transmission of standard Profibus frame

Standard references

PROFIBUS profile

PROFIBUS Profile,
Fluid Power Technology,
Edition Oct. 2001

VDMA profile

Fluid Power Technology,
Proportional Valves and
Hydrostatic Transmissions, ver 1.1

Programming interface

E(Z)-SW-BP PC software using USB cable/adapter (see tech table **GS500**) or PROFIBUS DP master device

Configuration file

GSD (Electronic Device Data Sheet) enclosed in programming software DVD E(Z)-SW-BP

Manual

E(Z)-MAN-S-BP and QUICKSTART-BP, enclosed in programming software DVD E(Z)-SW-BP

4 EtherCAT features for digital drivers and controllers in EH execution

Physical

Serial input format	Industrial fieldbus type Fast Ethernet galvanically insulated IEC 61158-2
Transmission rate	2 x 100 Mbit/s (Fast Ethernet, Full-Duplex)
Max node	65535 slaves
Ethernet Standard	ISO/IEC 8802.3 frame format
EtherType	0x88A4 according IEEE 802.3
Cable length	0,2 - 100m (between two slave devices)
Cable type	CAT5 (4 wire twisted pair) according with T568B
Network topology	Line, tree and star
Termination	Device internally

Communication Protocol

Data Link Layer	EtherCAT use Standard Ethernet Frames: ISO/IEC 8802.3 + IEC 61784-2
Device Profile	CANopen over EtherCAT (CoE) DS408 - Fluid Power Technology EN 50325-4
Device type	Slave
Supported protocol	CANopen SDO Mailbox-Interface “CoE” Network Management PDO PDO Watchdog

Startup and configuration (as per DS301+DSP305)

Node setting	Automatic position addressing Device node addressing
Baudrate	100 Mbit/s (Automatic)
Update time	100 distributed nodes in 100 µs (set and actual value 16bit)

Fieldbus communication diagnostic (as per DS301)

Device Error	Emergency

Real-time communication (as per DS301 + DS408)

RPDO	4 PDOs messages to the driver (up to 32 byte for each PDO)
TPDO	4 PDOs messages from the driver (up to 32 byte for each PDO)
R(T)PDO types	Remotely requested

Non real-time communication (as per DS301 + DS408)

SDO	One SDO (1 Server + 1 Client)

Standard references

ISO 11898

Road Vehicles – Interchange of digital information controller area network (CAN) for High-speed communication

EN 50325-4

Industrial communication subsystem based on ISO 11898 (CAN) for controller device interfaces

CiA DS301

CANopen – Application Layer and Communication Profile for Industrial Systems

CiA DR303-1

Cabling and connector pin assignment

CiA DSP305

CANopen – Layer Setting Services and Protocol

CiA DS408

CANopen – Device Profile for Proportional Hydraulic Valves v 1.5.1

IEC 61158-2

Industrial communication networks
- Fieldbus specification - Part 2:
Physical layer specification and service definition

IEC 61784-2

Industrial communication networks
- Profiles - Part 2:
Additional fieldbus profiles for real-time networks based on ISO/IEC 8802.3

IEC 61076-2-101

Connectors for electronic equipment
- Product Requirements - Part 2-101:
Circular connectors -
Detail specification for M12 connectors with screw-locking

Programming interface

E(Z)-SW-EH PC software using USB cable/adapter (see tech table **GS500**) or EtherCAT master device

Configuration file

XML (Electronic Device Data Sheet) enclosed in programming software DVD E(Z)-SW-EH

Manual

E(Z)-MAN-S-EH and QUICKSTART-EH, enclosed in programming software DVD E(Z)-SW-EH