

# Dupline® Field- and Installationbus Dupline® Ethernet Modbus/TCP Gateway Type G 3891 0052



- Built-in Dupline® channel generator
- Modbus/TCP Slave
- 10 and 100 Mbit operation, full or half duplex
- Twisted pair cables
- Read/control 128 Dupline® inputs/outputs
- Split-I/O mode selectable (128 inputs and 128 outputs)
- Support of 3 1/2 digit BCD and AnaLink analog formats
- For mounting on DIN-rail (EN 50 022)
- LED indicators for supply, Dupline® carrier and fault
- LED indicators for Ethernet link, module status and activity
- AC power supply

## Product Description

Dupline® Channel Generator with the function of an Ethernet Modbus/TCP slave. This means that digital as well as analog Dupline® I/O's can be read/controlled from Mod-

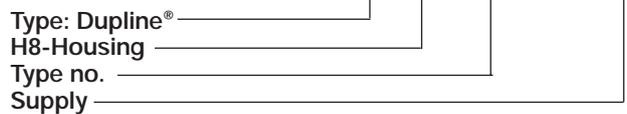
bus/TCP masters (PC's, PLC's etc.). The unit supports both Analink and Multiplexed analog signals. Several Dupline® gateways can be connected to the same Ethernet network.

## Type Selection

Supply	Ordering no.
115/230 VAC	G 3891 0052 230

## Ordering Key

**G 3891 0052 230**



## Input/Output Specifications

<b>Ethernet</b> Protocol Connector Communication Speed IP address setting  Dielectric voltage Ethernet - Dupline®	Modbus/TCP RJ45 (standard) 10 or 100 Mbit operation via DIP-switches or PC (arp command)  ≥ 4 kVAC (rms)	<b>Adjustments</b> 1 x 16 pos. rotary switch  DIP-switch 1 DIP-switch 2 DIP-switch 3 DIP-switch 4 DIP-switch 5-12	No. of Dupline® channels 8 .. 128 in steps of 8 Dupline® mode (Normal/Split I/O) Dupline® analog Analog input protocol Analog output protocol IP address
<b>Dupline®</b> Output voltage Output current Short-circuit protection All channels ON detector Output impedance Sequence time	8.2 V ≤ 100 mA Yes Yes ≤ 15 Ω 132.3 ms (@ 128 channels)	<b>Approvals</b> Electrical safety  <b>CE-marking</b>	UL (pending)  Yes

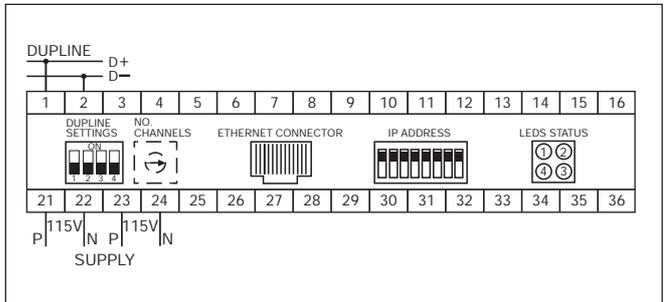
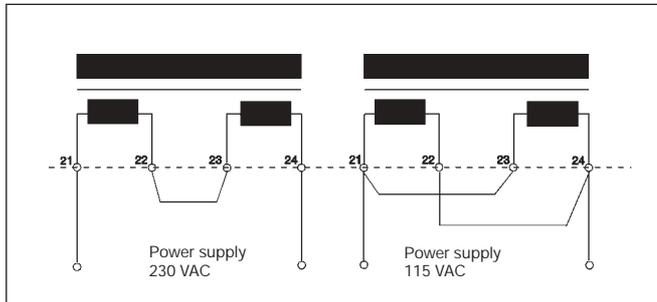
## General Specifications

<b>Power ON delay</b>	< 2.5 s until start of Dupline® carrier. < 40 s until correct reading of AnaLink values
<b>Indication for</b>	
Supply ON	LED, green
Dupline® carrier	LED, yellow
Fault	LED, red
Ethernet Link	LED, green
Ethernet Module Status	LED, green/red
Ethernet Activity	LED, green
<b>Environment</b>	
Degree of protection	IP 20
Pollution degree	3 (IEC 60664)
Operating temperature	0° to +50°C (+32° to +122°F)
Storage temperature	-20° to +85°C (-4° to +185°F)
<b>Humidity (non-condensing)</b>	20 to 80% RH
<b>Mechanical resistance</b>	
Shock	15 G (11 ms)
Vibration	2 G (6 to 55 Hz)
<b>Dimensions</b>	H8-housing
<b>Material</b>	(see Technical information)
<b>Weight</b>	540 g

## Supply Specifications

<b>Power supply</b>	Rated operational voltage through term. 21, 22, 23 & 24	Overvoltage cat. III (IEC 60664)
	230	See wiring diagram
	115	230 VAC ± 15% (IEC 60038)
		115 VAC ± 15% (IEC 60038)
<b>Frequency</b>		45 to 65 Hz
<b>Rated operational power</b>		11 VA
<b>Rated impulse withstand voltage</b>	230	4 kV
	115	2.5 kV
<b>Dielectric voltage</b>		
Supply - Dupline®		≥ 4 kVAC (rms)
Supply - RS 485		≥ 4 kVAC (rms)

## Wiring Diagrams



## Mode of Operation

The Dupline® Ethernet Gateway is a Dupline® Channel Generator with the function of a Modbus/TCP slave. This means that the 128 Dupline® I/O's can be read/controlled by Modbus/TCP masters like PLC's and PC interface cards from many different suppliers. Several Dupline® Gateways can be connected to the same network and operate together with other Ethernet modules like operator panels, MMI's I/O modules etc.

### Dupline Configuration switches

The unit is equipped with the following Dupline configuration switches. (See also switch settings)

1x16 position rotary-switch for selecting Number of Dupline® Channels in the range 8..128 (in steps of 8). The selected letter indicates the last channel group available on Dupline®. If e.g. H is selected, the 64 channels in groups A..H will be available.

DIP-switch (1) for selection of Dupline® Operation Mode. In "Normal" mode, Dupline® operates as a peer-to-peer system where the channel generator automatically establishes a connection between Dupline® inputs and Dupline® outputs which are coded to the same Dupline® address. If e.g. an input coded for B5 is activated, the output(s) coded for B5 will also be activated. Consequent-

ly a Dupline® output can either be activated through the output-data received on Ethernet or by an active Dupline® input coded for the same Dupline® address. In "Split I/O" mode, the Dupline® inputs and Dupline® outputs are created independently by the channel generator. If e.g. an input coded for B5 is activated, the Gateway will make the information available on Ethernet (like in normal mode), but it will not automatically activate the Dupline® output(s) coded to B5. The Dupline® outputs are controlled exclusively through the output data received on Ethernet.

DIP-switch (2) for selection of analog data. In OFF position only Digital In/Out data are transferred. To enable analog data-I/O handling this DIP-switch must be ON.

DIP-switch (3) for selection of Analog input operation mode. When OFF the analog input data are read as AnaLink. Each channel from C1 to P8 is read as 8 bit analog data. When ON the analog input data are considered as 3 \_ digit BCD multiplexed data. The multiplex-control (Synchronization) are automatically set to operate on channels A1..A4, which then cannot be used for other purposes.

## Mode of Operation (cont.)

DIP-switch (4) for selection of Analog Output operation mode. When OFF the Analog outputs are emitted as AnaLink. When ON the Analog Output-data are emitted as 3 \_ digit Multiplexed data, and channels A1..A4 will control the multiplex addressing.

*Note:* Change of Dip-switch settings During operation, may cause reset of the Gateway.

### Dupline® Input Data

A part of the Gateway input processor reads all the 128 Dupline®-channels as Digital inputs (16 bytes) and another part reads the 112 channels (C1 to P8) as Analog inputs. Each Analog value is represented as a 16 bit word with MBS as sign and 15 bits of magnitude. This results in a total of 224 bytes containing all analog input-data. Since the sign of a valid Dupline analog value is always positive, the range is 0..32767, where 32767 corresponds to the max analog input. It is up to the user to read the data in the correct area (digital or analog) according to the type of module (digital or analog) he has installed on a Dupline address. All data are mapped with Digital input bytes starting at relative address 00 followed by the analog data. See In/out data mapping.

### Dupline® Output Data

A memory area of 16 bytes is available for control of the outputs of the 128 Dupline channels. If Normal mode is selected, the outputs can also be controlled from Dupline transmitters (OR-function). A memory area of 224 bytes is available for control of the 112 Analog output values. The data must be entered in the range 0..32767. The Gateway will convert them to the right Dupline format in accordance with the selected Analog Output operation mode. When Analog transmission is selected it is important to write the value FFFF Hex (-32767 decimal) to all those of the 112 output addresses where no analog output is desired. Otherwise the digital transmission will be disturbed. Also, in case 3 \_ digit BCD is selected, it should be noted that sending out analog values on one or more multiplex addresses on a double-group

(e.g. C-D) will disable the use of this entire double-group for digital transmission.

### IP address information

#### IP address

The IP address is used to identify each node on the TCP/IP network. Therefore, each node on the network must have a unique IP address. IP addresses are written as four decimal integers (0-255) separated by periods, where each integer represents the binary value of one byte in the IP address. This is called dotted-decimal notation.

#### Example:

Address 10000000 00001010 00000010 00011110 is written as 128.10.2.30

#### Subnet Mask

The IP address is divided into three parts - net ID, subnet ID and host ID. To separate the net ID and the subnet ID from the host ID, a subnet mask is used. The subnet mask is a 32-bit binary pattern, where a set bit allocates a bit for network/subnet ID, and a cleared bit allocates a bit for the host ID. Like the IP address, the subnet mask is commonly written in dotted-decimal notation.

#### Example:

To make the IP address 128.10.2.30 belong to subnet 128.10.2, the subnet mask shall be set to 255.255.255.0.  
Subnet Mask: 11111111 11111111 11111111 00000000 (255.255.255.0)

Net ID /Subnet ID/Host ID

Important Note: To be able to establish communication between two devices both devices must belong to the same subnet. If not, the communication must be done through a gateway. It is therefore recommended to configure the module to the same subnet as your PC (If e.g. the PC has IP address 192.168.2.21, then the IP address of the Dupline Ethernet Gateway must have an IP address 192.168.2.n , where n is a number in the range 1..255).

### IP address selection

The module offers two ways to configure the IP-address:

- By using the DIP switches in the front
- By using the arp-command from a PC

### Using the Configuration Switch for selection of IP address

The configuration switch provides an easy way to configure the module for intranet use. The switch represents the binary value of the last byte in the IP address. If the switch is set to a value between 1-255 the module will use the settings described below. (If the switches are all in the OFF-position, corresponding to the value 0, then the Gateway is set up to be configured using the arp-command from a PC.)

IP address: 192.168.0.n Subnet mask: 255.255.255.0 Gateway address: 0.0.0.0 (No gateway set)

The last byte (n) represents the binary value of the switches. Subnet mask and Gateway address settings are fixed to the above values when using the configuration switches.

#### Example:

The switches are set to 00010100 (20 decimal)  
The IP address of the module will be set to 192.168.0.20  
*Note:* These settings can only be used on an intranet. This is because the IP address that is being set belongs to the private address set.

### Using the Address Resolution Protocol (ARP) for selection of IP address

The IP address can be configured (or changed during runtime) using the ARP command from a PC. Below is an example on how to change the IP address from a MS DOS™ window (which is normally available under "accessories" as "Command prompt" in the windows programs menu).

```
arp -s <IP address> <MAC address>
ping <IP address>
arp -d <IP address>
```

### Example:

To set the IP address to 192.168.2.21 on a Dupline Ethernet Gateway with MAC address 00-30-11-02-10-DA the following commands should be issued in the "command prompt" window:

```
arp -s 192.168.2.21 00-30-11-02-10-DA
ping 192.168.2.21
arp -d 192.168.2.21
```

The arp -s command will store the IP and MAC addresses in the PC's ARP table. When the ping command is executed, the PC sends this information to the module using the MAC address. The module detects that it was addressed with the correct MAC address and adopts the IP address sent by the PC. (The arp -d command is optional, but it removes the static route from the PC ARP table).

This method can be used to reconfigure modules that already has been configured, or even to reconfigure modules outside the host's subnet.

Important note: The MAC address is printed on a label on the bottom side of the module.

Important note: As the Arp command automatically configures the subnet mask to 255.255.255.0, the first three bytes of the IP address must be the same as for the PC executing the command.

#### Example:

PC - 192.168.2.67  
Module- 192.168.2.n (Where n is a value between 1 and 254)

## Modbus Memory Map

### Input (Hexadecimal notation)

Modbus addr				
Hex.	Dec.			
0000	0000	A-P	Digital	8 words
0008	0008	C-D	Analog	16 words
0018	0024	E-F	Analog	16 words
0028	0040	G-H	Analog	16 words
0038	0056	I-J	Analog	16 words
0048	0072	K-L	Analog	16 words
0058	0088	M-N	Analog	16 words
0068	0104	O-P	Analog	16 words

### Outputs (Hexadecimal notation)

Modbus addr				
Hex.	Dec.			
0400	1024	A-P	Digital	8 words
0408	1032	C-D	Analog	16 words
0418	1048	E-F	Analog	16 words
0428	1064	G-H	Analog	16 words
0438	1080	I-J	Analog	16 words
0448	1096	K-L	Analog	16 words
0458	1112	M-N	Analog	16 words
0468	1128	O-P	Analog	16 words

### Analog input data - memory map

Modbus addr		
Hex.	Dec.	
0008	0008	Analink C1 or C-D mux 0
0009	0009	Analink C2 or C-D mux 1
0017	0023	Analink D8 or C-D mux F
0018	0024	Analink E1 or E-D mux 0
0076	0118	Analink P7 or O-P mux E
0077	0119	Analink P8 or O-P mux F

### Analog output data - memory map

Modbus addr		
Hex.	Dec.	
0408	1032	Analink C1 or C-D mux 0
0409	1033	Analink C2 or C-D mux 1
0417	1047	Analink D8 or C-D mux F
0418	1048	Analink E1 or E-D mux 0
0476	1142	Analink P7 or O-P mux E
0477	1143	Analink P8 or O-P mux F

### Digital input data - bit memory map

Modbus addr			
Hex.	Dec.	MSB	LSB
0000	0000	A1	B8
0001	0001	C1	D8
0006	0006	M1	N8
0007	0007	O1	P8

### Digital output data - bit memory map

Modbus addr			
Hex.	Dec.	MSB	LSB
0400	1024	A1	B8
0401	1025	C1	D8
0406	1030	M1	N8
0407	1031	O1	P8

### ANALOG DATA FORMAT:

All analog values are scaled linearly to 15 bit binary format (Min analog value: 0 , Max analog value 32767)

## Supported Modbus Function Codes

Function Code	Function Name	Class	Affects Area
1	Read coils	1	IN/OUT
2	Read input discretes	1	IN/OUT
3	Read multiple registers	0	IN/OUT
4	Read input registers	1	IN/OUT
5	Write coil	1	OUT
6	Write single register	1	OUT
7	Read exception status	2	-
15	Force multiple coils	2	OUT
16	Force multiple registers	0	OUT
22	Mask write register	2	OUT
23	Read/Write registers	2	IN/OUT

## Switch Settings

**Number of Dupline Channels**  
 A: Group A 8 channels  
 B: Groups A..B 16 channels  
 P: Groups A..P 128 channels

<b>1: Dupline Operation Mode</b> OFF: Normal (Peer-to-Peer) ON: Split I/O mode	<b>3: Analog Input protocol</b> OFF: AnaLink ON: Multiplex
<b>2: Dupline Data Transfer mode</b> OFF: Digital only ON: Digital + Analog	<b>4: Analog Output protocol</b> OFF: AnaLink On: Multiplex

**IP Address**

IP Address	Set DIP 8
arp	00000000
192.168.0.1	00000001
192.168.0.2	00000010
192.168.0.253	11111101
192.168.0.254	11111110
192.168.0.255	11111111

## Ethernet LED Indicators (right hand side of the module)

	ON	OF	Blinking
LED 1	The module has a link	The module has no link	
LED 2	IP address set via arp cmd		IP address set via switches
LED 4			Blinks when a packet is received or transmitted