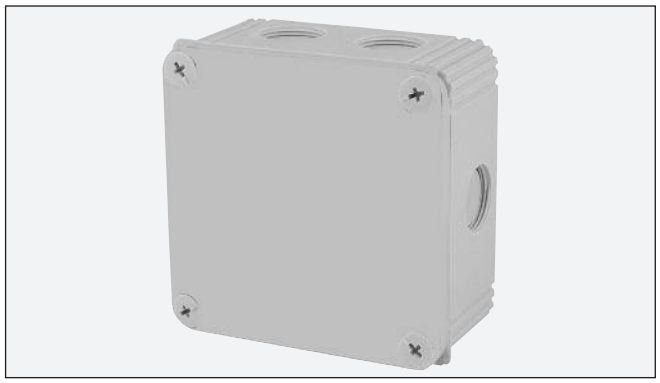
Dupline® Car Park System
Type GP6591 0291
BCD Display Interface



- **Low power consumption**
- **Configurable device for monitoring of free parking bays in an area**
- **Protected against dust and moisture**
- **Dupline® 3-wire system with power**
- **Adress coding with GAP1605**

Product Description

The GP6591 0291 BCD display interface forms part of the Car Park system which contains several variants of sensors and passive LED modules. Furthermore, the car park system contains displays for displaying the number of free parking bays.
The BCD display interface GP6591 0291 is completly equal to the direction indicator GP6565 0201, exept that it has not built-in LED's.
It is developed to be used together with the display GP6763 0105.
It is possible to install up to 36 direction indicators or BCD display onterfaces, in one carpark system.
The BCD display interface is the intelligent part of the car park system, and using different settings it is possible to create different functions, depending on the user's requirements and the size of the facility.

Ordering Key

GP6591 0291

Type: Dupline®
Housing
Input Type
Channels
Interface
Mains

Type Selection

GP 6591 0291 BCD display interface

Input/Output Specifications

2-pin connector for Bus L_1
- **Pin 1: Dupline® - (L_1 bus)**
- **Pin 2: Dupline® + (L_1 bus)**

3-pin connector for Bus L_2
- **Pin 1: Dupline® + (L_2 bus)**
- **Pin 2: GND Minus supply or Dupline® minus (L_2 bus)**
- **Pin 3: 24 VDC external power supply (L_2 bus)**

RJ45 connector for address programming using GAP 1605

3-pin connector for RS485
- **Pin 1: A (RS485)**
- **Pin 2: Dupline® - or GND (L_1 bus)**
- **Pin 3: B (RS485)**

Supply Specifications

Power supply:	24 V DC min.; 30 VDC max. (Overvoltage category III (IEC60664))
Current consumption from L_1 bus:	< 1 mA
Current consumption from L_2 bus:	< 1 mA
Current consumption from external power supply:	40 mA
Power consumption:	< 5 W
Electrical insulation between Dupline® bus L_1 and L_2:	1,500 Vrms

General Specifications

The BCD display interface uses four Dupline® channels and can be programmed as follows:

• I/O 1: Start marker	Input
• I/O 2: End marker	Input
• I/O 5: Start marker	Output
• I/O 6: End marker	Output

- I/O's 1 and 5 are a Start marker which is the Dupline® address before the first sensor
- I/O's 2 and 6 are a End marker which is the Dupline® address after the last sensor

Connector for RS485:
- Follows the interface standard for EIA-RS485
- Data speed is 4,800 bps
- Flux of the data
  - Asyncronous mode, continuous receiving with no answer
  - Frame composition: 3 x (1 start bit + 8 data bit + 1 stop bit)

Note:
The starting of the frame is syncronised with the last positive edge of the Dupline® frame with a delay of 1 mSec

Environment

- **Protection: IP 66**
- **Operating temperature: -25 °C to 70°C (-13°F to 158°F)**
- **Storage temperature: -40°C to 85°C (-40°F to 185°F)**
- **Pollution degree: 3 (IEC 60664)**
- **Relative humidity: Maximum 93%**
- **Dimensions: 110 x 110 x 66 mm**
- **Material: The housing is made of polypropylene. The BCD display interface lid is made of clear Polycarbonate**

Mode of Operation

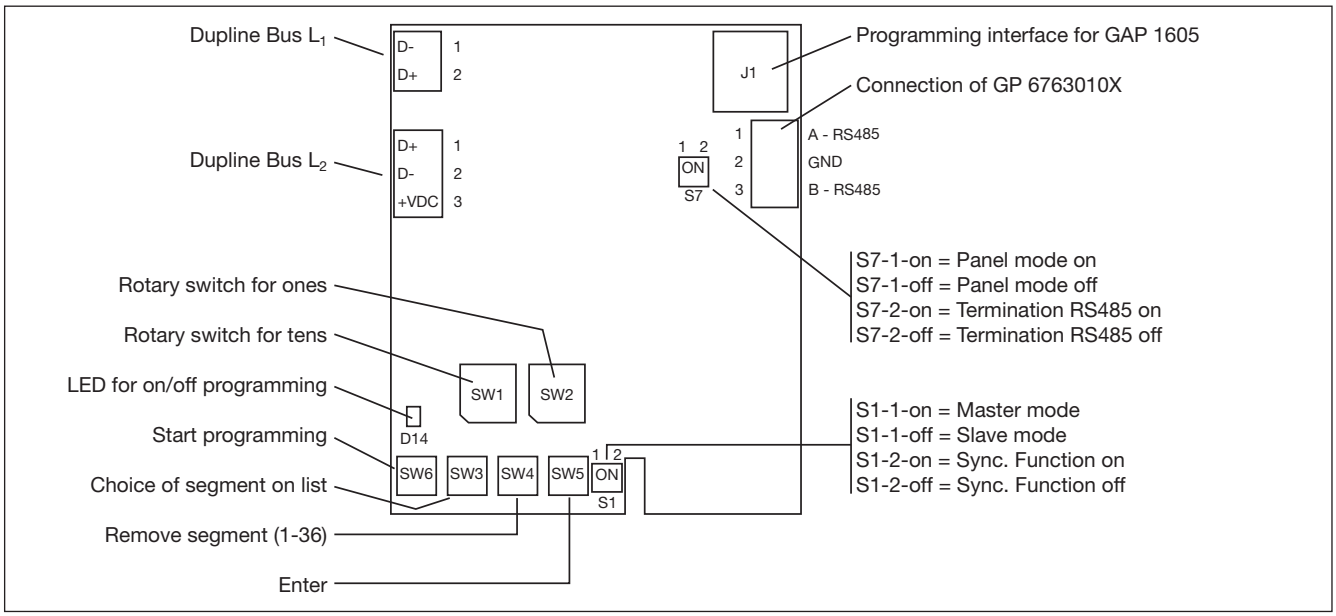
The GP6591 0291 BCD display interface is the intelligent part of the car park system. Its primary purpose is to read the number of free parking bays. Its secondary function is to transmit this information, e.g. to displays GP6763 010X.
The unit consists, among other things, of two galvanically separate Dupline® buses L_1 and L_2.The two buses are programmed using GAP 1605 or locally using rotary switches and switches. The programming and connection of the two buses depends on the mode for which the system is set. The four different modes and the programming will be explained later.
Depending on the mode selected, either display GP6763 010X or an intelligent unit can be connected to the connector for RS485. The GP6763 010X is a passive unit that can indicate the number of free parking bays or be used as a monitor when programming the GP6591 0291.

All Dupline® addresses can be used, except the address used for multiple calibration and the syncronized adresses. The addresses used for this purpose is normally
- calibration address: A1 (but optional)
- synchronization address: P5 and P6
- non-operational addresses: P7 and P8

The synchronization addresses are explained in the datasheet for GP34960005. P7 and P8 have no function and must not be used.

Example of GAP programming:
I/O 1 and 5 = A2 marker start
I/O 2 and 6 = N2 marker end
This means that there are 103 sensors in this system.

Internal drawing of BCD display interface and explanation of functions



Programming Modes

The BCD display interface can be set for different modes according to requirements. Remember to set the DIP switches before the power supply is turned on.
The different modes are designated as follows:

- Sync. operating mode
- Master operating mode
- Slave mode
- Panel mode

Sync. Operating Mode (Synchronization)

This mode is configured by setting DIP switch S1-2 (on).
Sync. mode can only be allocated to one GP6591 0291 in every system. The GP6591 0291 set to sync. mode can concurrently be set to either master mode or slave mode.
Sync. mode operates only on L_2. This means, if several BCD display interfaces are connected via L_2, only one must be set into sync. mode.

Master Operating Mode

This mode is configured by setting DIP switch S1-1 (on).
Master mode is also a summary mode where all available parking bays (from the sensors) are collected from L_2. L_1 is not used in this mode. If anything is connected to L_1 in master mode, this data will thus be ignored.
Only one direction indicator in this network can be set to sync. mode. It is possible to connect several direction indicators to the system without sync., in order to see the total or individual number of free spaces, regardless of position on the bus.
All information from the Carpark System, will be send via the direction indicator to the RS485 port to the display GP6763010x.

Programming Procedure
The direction indicator must be taught the areas to be controlled. This is done via the internal programming inside the direction indicator. The internal programming takes place using switches and rotary switches on the direction indicator PCB and has nothing to do with Dupline® addresses and Dupline® programming.

Press SW6 for approx. 1 sec. to activate the programming mode. LED D14 will turn off briefly.
If nothing is pressed for 15 sec., the programming mode will exit.
Deleting the memory in GP6565 0201:
Set SW1 and SW2 respectively to 99. Press SW5 for approx. 1 sec. LED D14 will confirm deletion of the memory by turning off briefly for approx. 2 seconds.
Programming of segments (1-36) is set on SW1 and SW2, respectively, and confirmed by pressing SW3 (enter). This is confirmed by LED D14 which will turn off briefly for approx. 1 second. If you want to enter more segments, repeat the above procedure.
It is also possible to delete segments. Set SW1 and SW2 to the desired segment and press SW4 for approx. 1 second. LED D14 will confirm this by turning off briefly for 1 second.
By setting SW1 and SW2 to 00, it is possible, by pressing SW5, to scroll through the program. Read the settings directly on display GP6763 010X.

ACTION	SW--SW2 setting	Button to be pressed	LED	Indication on GP6763010x
Entering into procedure	--	SW6	OFF ?ON	P 00
Clear all the memory	99	SW5	OFF x 2”	C00
Segment number to be inserted	N. of segment	SW3	OFF x 1”	A00
Segment number to be removed	N. of segment	SW4	OFF x 1”	R00
See complete list of programmed area	00	SW5	OFF x 2”	L00

Slave Operating Mode

This mode is configured by setting DIP switch S1-1 (off).
This is a “stand alone” mode without external control (PC, PLC or similar). Slave mode uses both Dupline® buses L_1 and L_2. In slave mode, the direction indicator will take the number of free parking bays from L_1 and put them into a segment on L_2. The data will be transferred to display GP6763 010X through a RS485 interface.
There will be no need for L_2 if there is no connection between the direction indicators. The direction indicators can detect this automatically.
If L_1 is disconnected by accident, the direction indicator will send it’s information to the display GP6763010x.
The L_2 Bus is reserved only to connect all the indicators distributed along the park building, as it supports a special data protocol. On this Bus the indicators working in SLAVE mode insert binary data, which hold information about vacant parking places available in a determined area. This function is supported by a dedicated protocol derived from the standard one; this protocol uses 4 consecutive frames of the original Dupline® protocol.
A coding status for allocating up to 36 indicators should be provided by one of the indicators previously configured in SYNC operating mode. This coding status divides each frame into 9 data fields 14 bit wide with 6 bit for the indicator address and 8 bit for the indication of a vacant parking place.

Address mapping of the indicators in the L_2 Dupline® frame

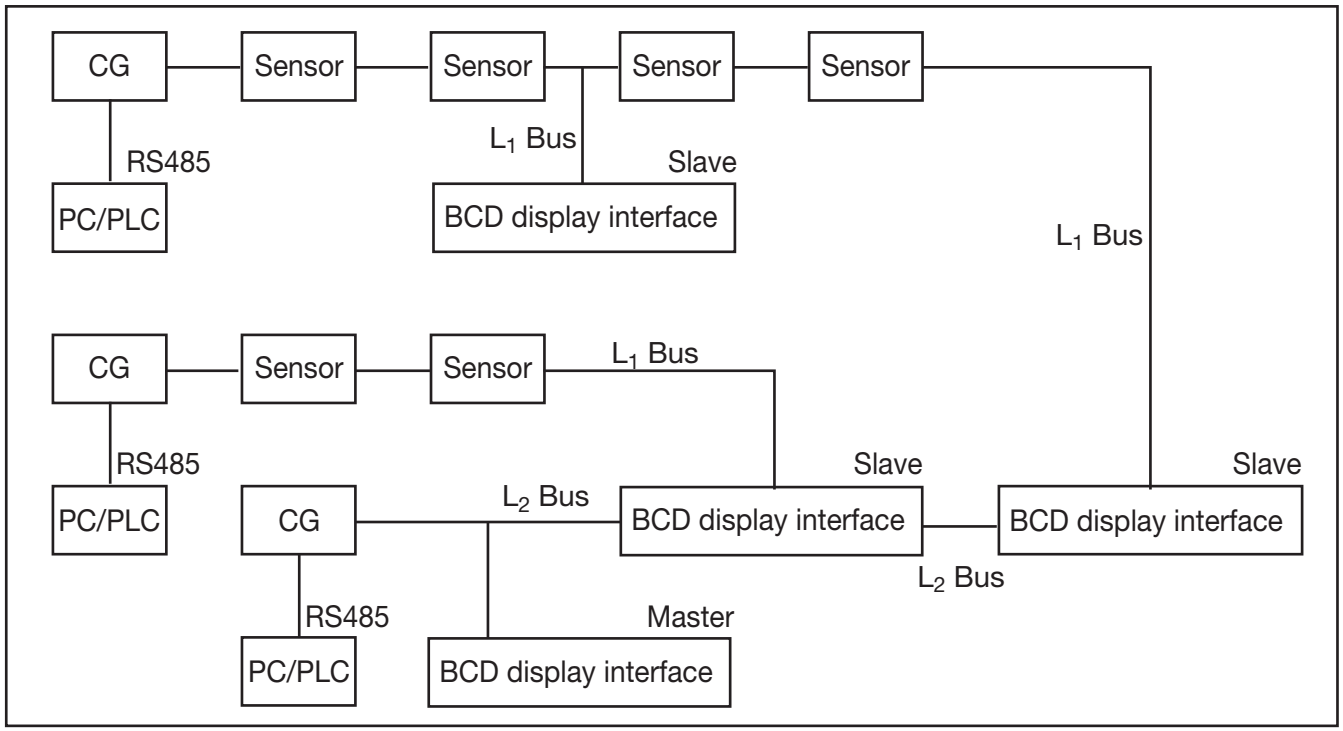
L_2 assignment with indicator configured in MASTER or SLAVE mode

1st frame	Adress assignment	Data assignment
BCD display interface N.36	A1 - A6	A7 - B6
BCD display interface N.35	B7 - C4	C5 - D4
-	-	-
BCD display interface N.29	M3 - M8	N1 - N8
BCD display interface N.28	O1 - O6	O7 - P6

2nd frame	Adress assignment	Data assignment
BCD display interface N.27	A1 - A6	A7 - B6
BCD display interface N.26	B7 - C4	C5 - D4
-	-	-
BCD display interface N.20	M3 - M8	N1 - N8
BCD display interface N.19	O1 - O6	O7 - P6

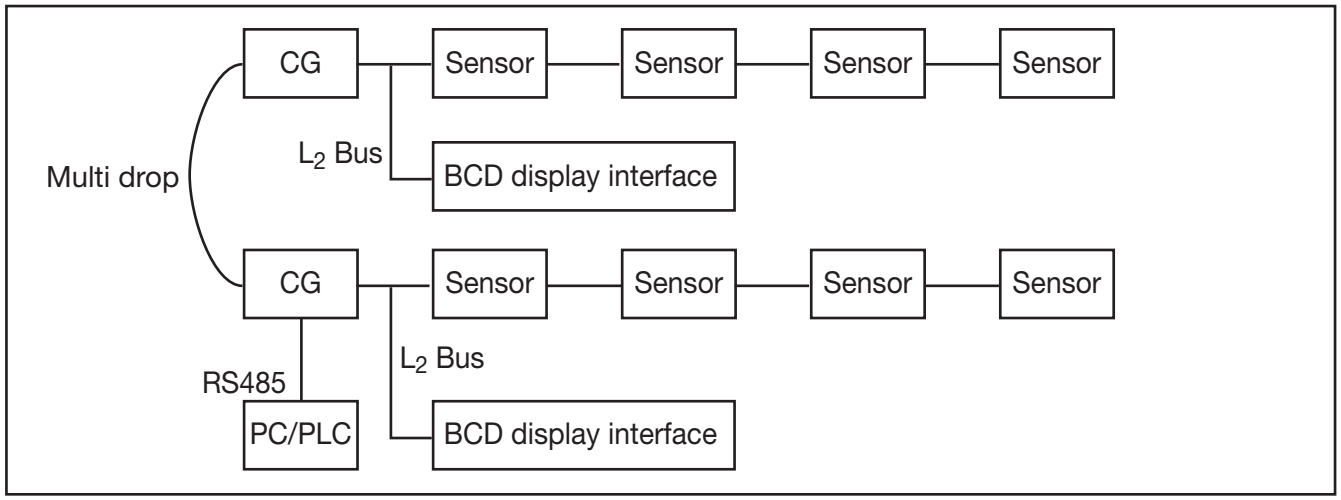
3rd frame	Adress assignment	Data assignment
BCD display interface N.18	A1 - A6	A7 - B6
BCD display interface N.17	B7 - C4	C5 - D4
-	-	-
BCD display interface N.11	M3 - M8	N1 - N8
BCD display interface N.10	O1 - O6	O7 - P6

4th frame	Adress assignment	Data assignment
BCD display interface N.9	A1 - A6	A7 - B6
BCD display interface N.8	B7 - C4	C5 - D4
-	-	-
BCD display interface N.2	M3 - M8	N1 - N8
BCD display interface N.1	O1 - O6	O7 - P6



Panel Operating Mode

This mode is configured by setting DIP switch S7-1 (on). This is the lowest mode and is used if there is a need for remote control (PC, PLC etc.). Only one bus L2 is used. L1 must not be connected to the BCD display interface.



L_2 assignment with BCD display interface configured in PANEL mode

Configuration	SLAVE on L_1	SLAVE on L_2	MASTER on L_2	Panel on L_2
Address occupancy	2 (for markers)	6 (bit for adress) + 8 (for data)	6 (bit for adress) + 8 (for data)	8 (for data)

Channel Mapping of the Sensors

Address mapping of the sensors in the L_1 Dupline® frame

L_1 assignment with all sensors configured at full capability (4 I/O configuration)

Dupline assignment	I/O 1	I/O 5	I/O 6	I/O 7
Sensor N.1	A2	A3	P5	A1
Sensor N.2	A4	A5	P6	A1
-	-	-	-	-
Sensor N.60	P1	P2	P5	A1
Sensor N.61	P3	P4	P6	A1

L_1 assignment with all sensors configured at reduced capability (2 channel configuration)

Dupline assignment	I/O 1	I/O 6	I/O 7	
Sensor N.1	A2	P5	A1	
Sensor N.2	A3	P6	A1	
-	-	-	-	
Sensor N.122	P3	P5	A1	
Sensor N.123	P4	P6	A1	

L_1 assignment with sensors at reduced capability and one Direction indicator

Dupline assignment	Sensor I/O 1	Sensor I/O 7	I/O 6	Indicator Start marker	Indicator End marker
Sensor N.1	A3	A1	P5		
Sensor N.2	A4	A1	P6		
-	-	-	-		
Sensor N.120	P2	A1	P5		
Sensor N.121	P3	A1	P6		
Direction indicator				A2	P4

***NOTE:** P5, P6, P7 and P8 addresses must not be assigned to the End marker of indicator. P5 and P6 are assigned to the sensors' sync. signal. P7 and P8 must not be used.

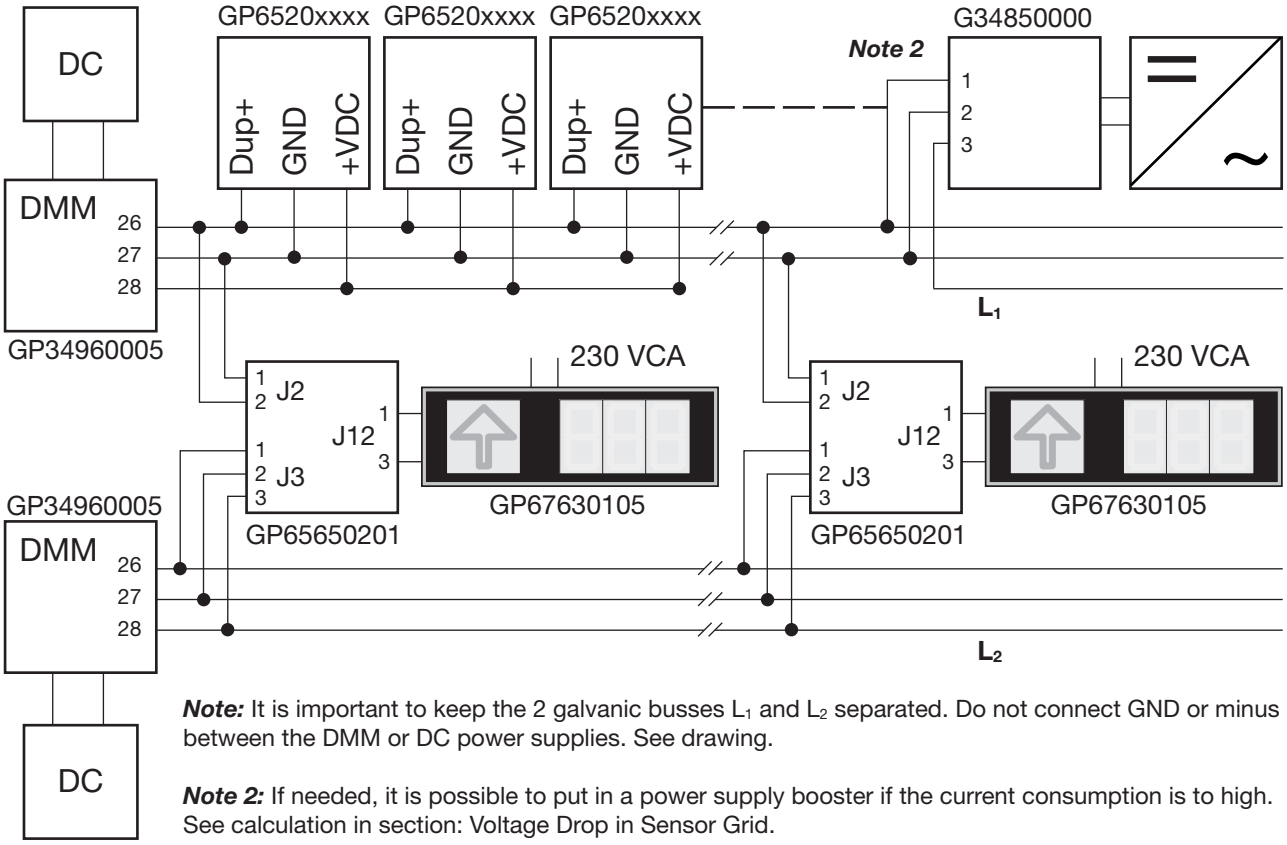
Address mapping of the sensors in the L_2 Dupline® frame

L_2 assignment with indicator configured in PANEL mode

Dupline frame	Data assignmment			
Direction indicator N.1	A1 - A8			
Direction indicator N.2	B1 - B8			
-	-			
Direction indicator N.15	O1 - O8			
Direction indicator N.16	P1 -P8			

Example of a System in Slave Mode with tree Sensors, two Direction Indicators and two Displays

The direction indicator are set up as “slave” using switches. It is programmed using GAP 1605.
I/O’s 1 and 5 are programmed to “A2” (marker start).
I/O’s 2 and 6 are programmed to “A6” (marker end).
The I/O 1 on the sensors are addressed “A3”, “A4” and “A5”, respectively, also using GAP 1605. The I/O6 on the sensors are addressed P5, P6 and P5 respectively. The I/O 7 are addressed to A1. The direction indicator now automatically knows which sensors to detect, because it looks at all addresses between start and end marker. This means that there can be many direction indicators on the same Dupline® network.
The display also have a function as a monitor when programming the direction indicator.



Note: It is important to keep the 2 galvanic busses L_1 and L_2 separated. Do not connect GND or minus between the DMM or DC power supplies. See drawing.

Note 2: If needed, it is possible to put in a power supply booster if the current consumption is to high. See calculation in section: Voltage Drop in Sensor Grid.

Voltage Drop in Sensor Grid

Due to the high current consumption of each sensor module, precautions should be taken to avoid voltage drops in the sensor network.
As indicated, the car park system is a 3-wire system.
Different power supply types can be used to supply the sensors, including third-party power supplies. Dupline® provides two different power supply couplers: G3485 0000, which is a power supply coupler, or DMM G3496 xxxx, which also includes an integrated channel generator.
They both feature a pulsating 30 VDC/3 A output on the third wire.
The DC supply for G3485 0000 is capable of supplying twice the total load current, as the output voltage on G3485 0000 is pulsating.

The following considerations are made for using G3485 0000:

The voltage drop for the output on G3485 0000 is **≤** 1.0 V. That is, for a 30 VDC input on the module you can achieve a maximum output of 29 VDC. Together with the voltage drop for the output of the GP65xx xxxx sensor, this must be taken into consideration when selecting the output voltage for the DC supply.

The voltage drop on the GP65xx xxxx sensors is calculated as: Uout G3485 0000 – Uin GP65xx xxxx = 29-22 = **7 V**

There is a limit for the voltage drop Vcw in the longest common wire. This limit can be calculated as follows:
Vcw = Rcw x Icw

Vcw = Voltage drop in longest common wire
Icw = Total current in longest common wire
Rcw = Resistance in longest common wire

If the load is distributed evenly along the 3-wire, Vcw = **3.5 V max.**
Vcw = (Vout (G3485 0000)-Vin (G6520 220x))/2 = (29-22)/2 = 3.5 V

In order to avoid voltage drops in the system, further G3485 0000 supply units can be added along the wire.

Note:
Remember to install the DC supply and the G3485 0000 supply unit close to each other to avoid voltage drops between the two modules. See the wiring diagram on the following page.

Calculation example for maximum wire length, sensor side:
Network with 30 sensors:

- G3485 0000 power supply output voltage = 29 VDC
- 30 GP6520 2201 sensors with 37 mA current consumption
- Cable = 1.5 mm^2. Cable resistance = 13 Ω/km
- Total current consumption = 30 x 37 = 1110 mA

Note: Please note that the calculation of the BCD display interfaces current consumption is made on the L_2 bus, not on the L_1 bus. Therefore, the BCD display interface is not included in the total current consumption of this calculation.

At a voltage drop for G3485 0000 of 3.5 V, the internal resistance is:
R = 3.5 V / 1110 mA = 3.15 Ω
Maximum wire length = 3.15 Ω/13 Ω/km = **242 meters**

Calculation example for maximum number of sensors at a specific wire length:

- Wire length stated at 500 m = (0.5 km)
- Cable type = 1.5 mm2. Cable resistance = 13 Ω/km
- Max. voltage drop = 3.5 VDC
- Max. current consumption for sensor = 37 mA

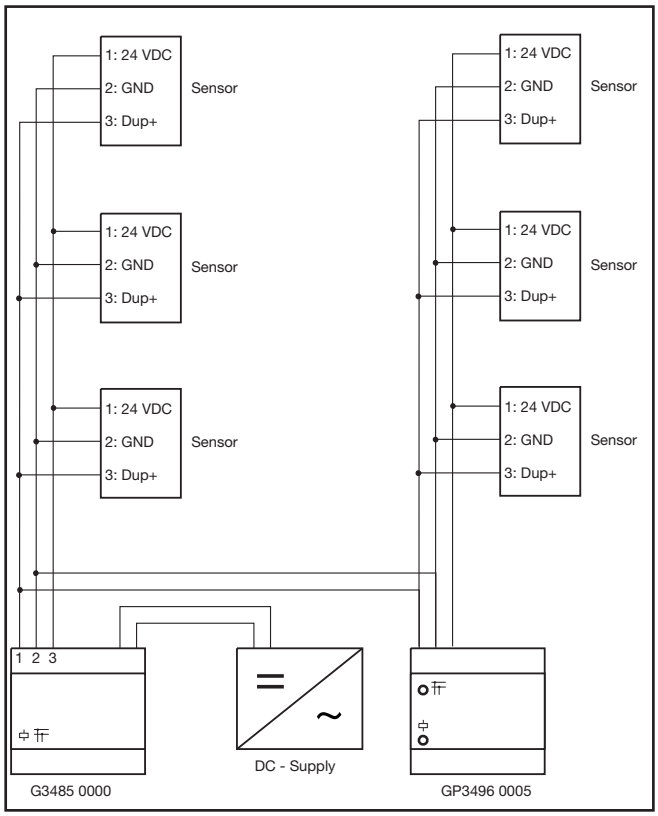
Total wire resistance = 0.5 km x 13/km = 6.5 Ω

Max. current consumption = 3.5 / 6.5 = 538 mA

Maximum number of sensors in the network: 538 / 37 = **14 sensors**

Rule of thumb:
For each 100 meters, 60 sensors can be placed when using a 1.5 mm^2 cable.

Example of a Wiring Diagram



Dimensions