1354 SUPPLEMENTAL ATTACHMENT					
New Equipment Wrong Way Detection					
TAG NO.	MATERIAL DESCRIPTION	MODEL	SERIAL NUMBER	LNA Warrarty	MANUFACTURER WARRANTY
Wrong Way Detection					
East Gate B1973	Alarm	Audible Alarm	Edwards 877-G1	1 Year starting 10/23/2020	1 Year starting 10/23/2020
	Wrongway Sign	0085359C9	P-50644946	1 Year starting 10/23/2020	1 Year starting 10/23/2020
	Tapco Box	SKU:500479V	J-647704-1002	1 Year starting 10/23/2020	1 Year starting 10/23/2020
Main Gate B4	Alarm	Audible Alarm	Edwards 877-G1	1 Year starting 10/23/2020	1 Year starting 10/23/2020
	Wrong Way Sign	0085359C9	Q-34151720	1 Year starting 10/23/2020	1 Year starting 10/23/2020
	Tapco Box	SKU:500479v	J-647704-1001	1 Year starting 10/23/2020	1 Year starting 10/23/2020
441 Gate B2349	Alarm	Audible Alarm	Edward 877-G1	1 Year starting 10/23/2020	1 Year starting 10/23/2020
	Wrong Way Sign	0085359C9	P-50644947	1 Year starting 10/23/2020	1 Year starting 10/23/2020
	Tapco Box	SKU:500479V	J-647704-1003	1 Year starting 10/23/2020	1 Year starting 10/23/2020

PERIMETER
SECURITY
PARTNERS

Product Data

5038 Thoroughbred Lane Brentwood, Tennessee 37027 ◆ www.perimetersecuritypartners.com
(615) 953-8872 main ◆ (615) 468-6311 fax ◆ (844) 277-8586 service

PERIMETER
SECURITY
PARTNERS

ARGUS
Interface Panel

5038 Thoroughbred Lane Brentwood, Tennessee 37027 ◆ www.perimetersecuritypartners.com
(615) 953-8872 main ◆ (615) 468-6311 fax ◆ (844) 277-8586 service

MEAN WELL

120W Single Output Industrial DIN RAIL

EDR-120 series

R33100 RoHS TPTC004 EN62368-1 IEC62368-1

Features

- Universal AC input / Full range
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or 15
- UL 508 (industrial control equipment) approved
- EN61000-6-2(EN50082-2) industrial immunity level
- 100% full load burn-in test
- 2 years warranty

Applications

- Industrial control system
- Semiconductor fabrication equipment
- Factory automation
- Electro-mechanical apparatus

Description

EDR-120 is one economical slim 120W DIN rail power supply series, adapt to be installed on TS-35/7.5 or TS-35/15 mounting rails. The body is designed 40mm in width, which allows space saving inside the cabinets. The entire series adopts the full range AC input from 90VAC to 264VAC and conforms to EN61000-3-2, the norm the European Union regulates for harmonic current.

EDR-120 is designed with metal housing that enhances the unit's power dissipation. With working efficiency up to 88.5%, the entire series can operate at the ambient temperature between -20℃ and 60℃ under air convection. It is equipped with constant current mode for over-load protection, fitting various inductive or capacitive applications. The complete protection functions and relevant certificates for industrial control apparatus (UL508, TUV EN62368-1, and etc.) make EDR-120 a very competitive power supply solution for industrial applications.

Model Encoding

EDR - 120 - 12

- 12 — Output voltage
- 120 — Output wattage
- EDR — Series name

MEAN WELL

120W Single Output Industrial DIN RAIL

EDR-120 series

SPECIFICATION

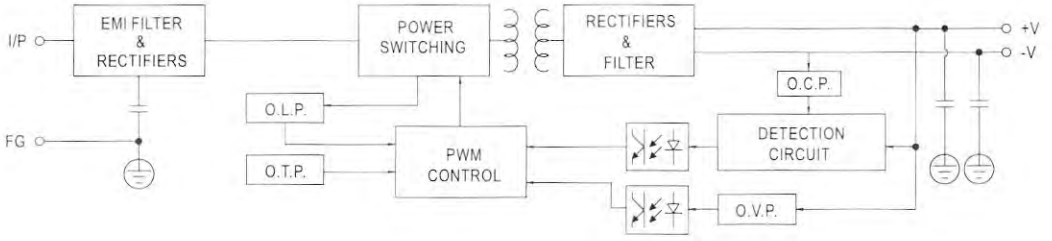
MODEL		EDR-120-12	EDR-120-24	EDR-120-48
OUTPUT	DC VOLTAGE	12V	24V	48V
	RATED CURRENT	10A	5A	2.5A
	CURRENT RANGE	0 ~ 10A	0 ~ 5A	0 ~ 2.5A
	RATED POWER	120W	120W	120W
	RIPPLE & NOISE (max.) Note.2	100mVp-p	120mVp-p	150mVp-p
	VOLTAGE ADJ. RANGE	12 ~ 14V	24 ~ 28V	48 ~ 55V
	VOLTAGE TOLERANCE Note.3	±2.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.5%	±0.5%
	LOAD REGULATION	±1.0%	±1.0%	±1.0%
	SETUP, RISE TIME	1200ms, 60ms/230VAC 2500ms, 60ms/115VAC at full load		
	HOLD UP TIME (Typ.)	16ms/230VAC 10ms/115VAC at full load		
INPUT	VOLTAGE RANGE Note.6	90 ~ 264VAC 127 ~ 370VDC	[DC input operation possible by connecting AC/L(+), AC/N(-)]	
	FREQUENCY RANGE	47 ~ 63Hz		
	EFFICIENCY (Typ.)	85%	87.5%	88.5%
	AC CURRENT (Typ.)	2.25A/115VAC 1.3A/230VAC		
	INRUSH CURRENT (Typ.)	20A/115VAC 35A/230VAC		
	LEAKAGE CURRENT	<1mA / 240VAC		
PROTECTION	OVERLOAD	105 ~ 130% rated output power		
		Protection type : Constant current limiting, recovers automatically after fault condition is removed		
	OVER VOLTAGE	14 ~ 17V	29 ~ 33V	56 ~ 65V
		Protection type : Shut down o/p voltage, re-power on to recover		
	OVER TEMPERATURE	Shut down o/p voltage, re-power on to recover		
ENVIRONMENT	WORKING TEMP.	-20 ~ +60℃ (Refer to "Derating Curve")		
	WORKING HUMIDITY	20 ~ 95% RH non-condensing		
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH		
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)		
	VIBRATION	Component:10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes; Mounting: Compliance to IEC60068-2-6		
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL508, TUV EN62368-1, EAC TP TC 004, BSMI CNS14336-1 approved,(meet EN60204-1)		
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:2KVAC O/P-FG:0.5KVAC		
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:>100M Ohms / 500VDC / 25℃/ 70% RH		
	EMC EMISSION	Compliance to EN55032 (CISPR32) Class A, EN61000-3-2,-3, EAC TP TC 020, CNS13438 Class A		
	EMC IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11, EN55024, EN61000-6-2 (EN50082-2), heavy industry level, criteria A, EAC TP TC 020		
OTHERS	MTBF	474.6K hrs min. MIL-HDBK-217F (25℃)		
	DIMENSION	40*125.2*113.5mm (W*H*D)		
	PACKING	0.6Kg; 20pcs/13Kg/1.16CUFT		

NOTE

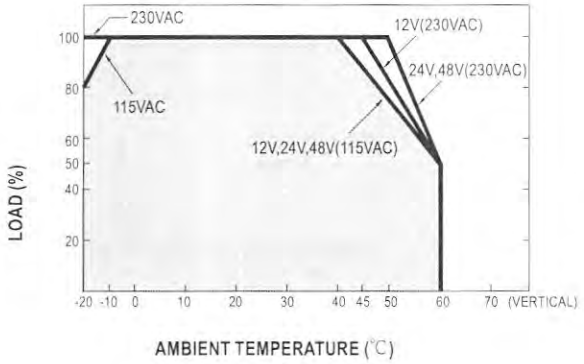
1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature.
2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor.
3. Tolerance : includes set up tolerance, line regulation and load regulation.
4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives.
5. Installation clearances : 40mm on top, 20mm on the bottom, 5mm on the left and right side are recommended when loaded permanently with full power. In case the adjacent device is a heat source, 15mm clearance is recommended.
6. Derating may be needed under low input voltage. Please check the derating curve for more details.
7. The ambient temperature derating of 3.5℃/1000m with fanless models and of 5℃/1000m with fan models for operating altitude higher than 2000m(6500ft).

■ Block Diagram

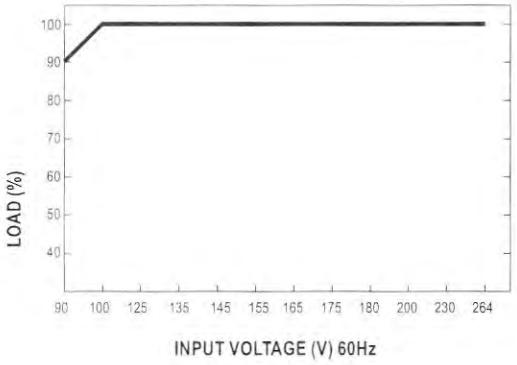
fosc : 70KHz



■ Derating Curve

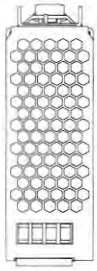


■ Static Characteristics

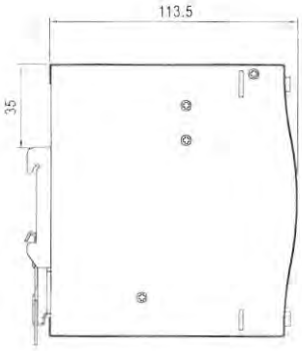


Mechanical Specification

Case No.992D Unit:mm

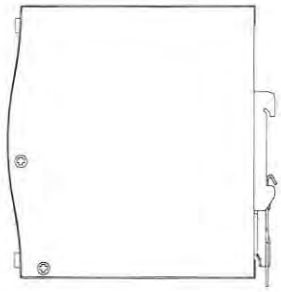


Top View

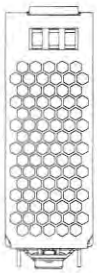


Side View

Front View



Side View



Bottom View

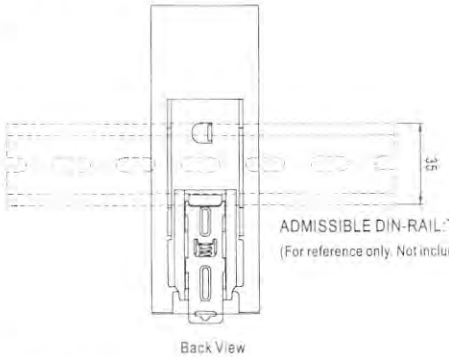
Terminal Pin No. Assignment (TB1)

Pin No.	Assignment
1	FG ⏚
2	AC/N or DC -
3	AC/L or DC +

Terminal Pin No. Assignment (TB2)

Pin No.	Assignment
1,2	DC OUTPUT -V
3,4	DC OUTPUT+V

Installation Instruction



ADMISSIBLE DIN-RAIL:TS35/7.5 OR TS35/15
(For reference only. Not included with unit.)

Back View

This series fits DIN rail TS35/7.5 or TS35/15.
For installation details, please refer to the Instruction manual.

Installation Manual

Please refer to : http://www.meanwell.com/manual.html

Relay Module - RIF-0-RSC-12DC/ 1AU - 2903365

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Pre-assembled relay module with screw connection, consisting of: relay base with ejector and multi-layer gold contact relay. Contact type: 1 N/O contact. Input voltage: 12 V DC

Product Description

The pluggable electromechanical and solid-state relays in the RIFLINE complete product range and the base are recognized and approved in accordance with UL 508.
The relevant approvals can be called up at the individual components in question.

RoHS

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	10 pc
GTIN	4 046356 732932
GTIN	4046356732932
Weight per Piece (excluding packing)	28.000 g
Custom tariff number	85364110
Country of origin	Czech Republic

Technical data

Note

Utilization restriction	EMC: class A product, see manufacturer's declaration in the download area

Dimensions

Width	6.2 mm
Height	84 mm
Depth	68 mm

Relay Module - RIF-0-RSC-12DC/ 1AU - 2903365

Technical data

Ambient conditions

Ambient temperature (operation)	-40 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Degree of protection	IP20 (Relay base)
	RT III (Relay)

Coil side

Nominal input voltage U_N	12 V DC
Input voltage range in reference to U_N	see diagram
Typical input current at U_N	16 mA
Typical response time	5 ms
Typical release time	8 ms
Coil voltage	12 V DC
Protective circuit	Damping diode
Operating voltage display	Yellow LED
Power dissipation for nominal condition	0.19 W

Contact side

Contact type	1 N/O contact
Type of switch contact	Single contact
Contact material	AgSnO, hard gold-plated
Maximum switching voltage	30 V AC
	36 V DC
Minimum switching voltage	100 mV (at 10 mA)
Min. switching current	1 mA (at 12 V)
Maximum inrush current	50 mA
Limiting continuous current	50 mA
Interrupting rating (ohmic load) max.	1.2 W (at 24 V DC)
Switching capacity	1 A (24 V (DC13))
	3 A (230 V (AC 15))

Contact side (with destroyed gold layer)

Contact material	AgSnO
Note	the following values are applicable if a gold layer is destroyed
Maximum switching voltage	250 V AC/DC
Minimum switching voltage	5 V (at 100 mA)
Limiting continuous current	6 A
Min. switching current	10 mA (at 12 V)
Interrupting rating (ohmic load) max.	140 W (at 24 V DC)
	20 W (at 48 V DC)

Relay Module - RIF-0-RSC-12DC/ 1AU - 2903365

Technical data

Contact side (with destroyed gold layer)

	18 W (at 60 V DC)
	23 W (at 110 V DC)
	40 W (at 220 V DC)
	1500 VA (for 250 V AC)
Switching capacity	2 A (at 24 V, DC13)
	0.2 A (at 110 V, DC13)
	0.1 A (at 220 V, DC13)
	3 A (at 24 V, AC15)
	3 A (at 120 V, AC15)
	3 A (at 230 V, AC15)

General

Test voltage relay winding/relay contact	4 kV_{rms} (50 Hz, 1 min.)
Operating mode	100% operating factor
Flammability rating according to UL 94	V2 (Housing)
Mechanical service life	approx. 2x 10^7 cycles
Service life, electrical	see diagram
Mounting position	any
Assembly instructions	In rows with zero spacing

Connection data

Connection name	Coil side
Connection method	Screw connection
Stripping length	7 mm
Conductor cross section solid	0.5 mm² ... 4 mm²
Conductor cross-section solid (2 conductors with same cross section)	0.5 mm² ... 1.5 mm²
Conductor cross section flexible	0.5 mm² ... 2.5 mm²
	0.5 mm² ... 2.5 mm² (Ferrules without plastic sleeve)
	0.5 mm² ... 1.5 mm² (Ferrule with plastic sleeve)
Conductor cross section flexible (2 conductors with same cross section)	0.5 mm² ... 1.5 mm²
	0.5 mm² ... 1 mm² (TWIN ferrule with plastic sleeve)
Conductor cross section AWG	20 ... 12 (solid)
	20 ... 14 (flexible)
Torque	0.5 Nm ... 0.6 Nm

Connection data 2

Connection name	Contact side
Connection method	Screw connection
Stripping length	7 mm

Relay Module - RIF-0-RSC-12DC/ 1AU - 2903365

Technical data

Connection data 2

Conductor cross section solid	0.5 mm² ... 4 mm²
Conductor cross-section solid (2 conductors with same cross section)	0.5 mm² ... 1.5 mm²
Conductor cross section flexible	0.5 mm² ... 2.5 mm²
	0.5 mm² ... 2.5 mm² (Ferrules without plastic sleeve)
	0.5 mm² ... 1.5 mm² (Ferrule with plastic sleeve)
Conductor cross section flexible (2 conductors with same cross section)	0.5 mm² ... 1.5 mm²
	0.5 mm² ... 1 mm² (TWIN ferrule with plastic sleeve)
Conductor cross section AWG	20 ... 12 (solid)
	20 ... 14 (flexible)
Torque	0.5 Nm ... 0.6 Nm

Standards and Regulations

Standards/regulations	DIN EN 50178
Rated insulation voltage	250 V AC
Rated surge voltage	6 kV
Insulation	safe isolation
Pollution degree	2
Overvoltage category	III

Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
China RoHS	Environmentally Friendly Use Period = 50 years
	For details about hazardous substances go to tab "Downloads", Category "Manufacturer's declaration"

Articles in set

Single relay - REL-MR- 12DC/21AU - 2961163

Plug-in miniature power relay, with multi-layer gold contact, 1 PDT, input voltage 12 V DC

Relay Module - RIF-0-RSC-12DC/ 1AU - 2903365

Articles in set

Relay base - RIF-0-BSC/ 1 - 2901872

RIF-0... relay base, for miniature power relay with 1 N/O contact or identical solid-state relays, screw connection, for mounting on NS 35/7,5

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Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214948
GTIN	4055626214948
Weight per Piece (excluding packing)	141.670 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	5 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

Standards/specifications	UL 489 IEC 60947-2

Environmental Product Compliance

REACh SVHC	Cadmium oxide 1306-19-0

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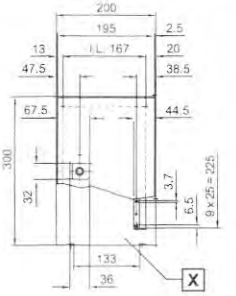
Enclosures

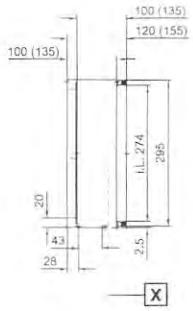
Compact enclosures

Compact enclosures AE

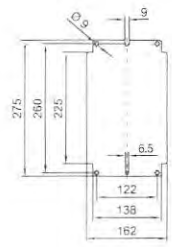
Spray-finished

AE 1032.500 (1035.500)

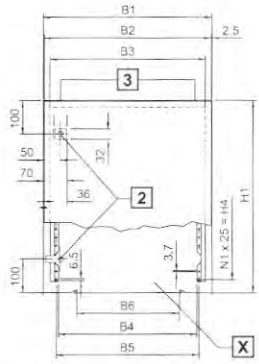


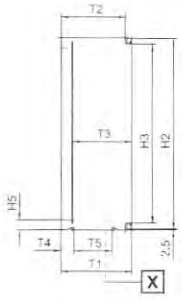


Mounting plate

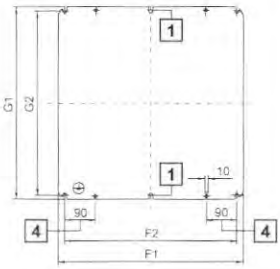


i.L. = Clearance width

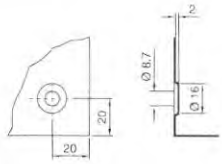




Mounting plate



Dimensions for wall-mounting



X Door interior view

1 Only for AE 1180.500

2 From 500 mm high with 2 cam locks, less than 500 mm with 1 cam lock in the centre

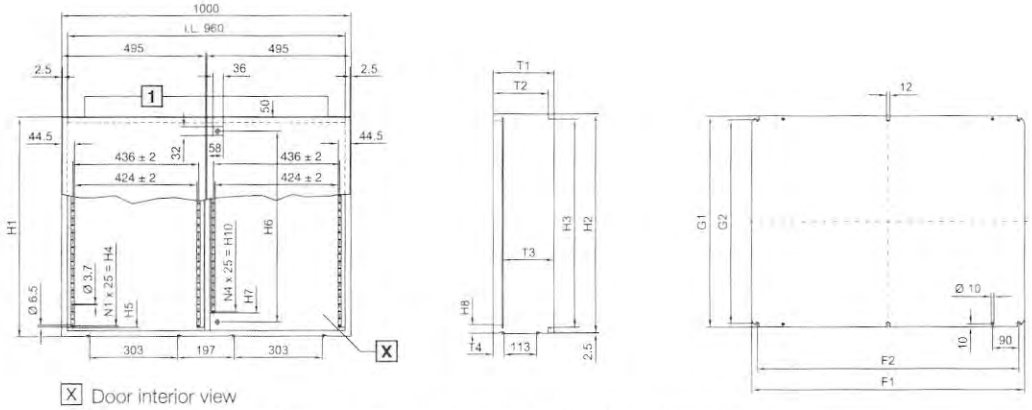
3 AE 1073.500 and AE 1180.500 with holes for eyebolts, view Y, see page 2 below.

4 (50) for AE 1033.500, AE 1034.500 and AE 1036.500

Model No. AE	Width dimensions mm						Height dimensions mm						Depth dimensions mm					Mounting plates mm			
Spray-finished	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	N1	T1	T2	T3	T4	T5	F1	F2	G1	G2
1036.500	300	295	260	211	223	233	300	295	260	225	27.5	9	155	132	113 – 129	47	45	254	215	275	250
1033.500	300	295	260	211	223	233	300	295	260	225	27.5	9	210	190	168 – 184	43	45	254	215	275	250
1034.500	300	295	260	211	223	233	400	395	360	325	27.5	13	210	190	168 – 184	43	45	254	215	375	350
1030.500	380	375	340	291	303	303	300	295	260	225	27.5	9	155	132	113 – 129	33	63	334	295	275	250
1031.500	380	375	340	291	303	303	300	295	260	225	27.5	9	210	190	168 – 184	33	63	334	295	275	250
1380.500	380	375	340	291	303	303	380	375	340	275	27.5	11	210	190	168 – 184	33	63	334	295	355	330
1039.500	600	595	560	511	523	500	380	375	340	275	27.5	11	210	190	168 – 184	38	113	549	510	355	330
1339.500	600	595	560	511	523	500	380	375	340	275	27.5	11	350	330	308 – 324	38	113	549	510	355	330
1038.500	380	375	340	291	303	303	600	595	560	525	30	21	210	190	168 – 184	33	63	334	295	570	545
1338.500	380	375	340	291	303	303	600	595	560	525	30	21	350	330	308 – 324	84	113	334	295	570	545
1045.500	400	395	360	311	323	303	500	495	460	425	30	17	210	190	168 – 184	38	113	354	315	475	450
1037.500	400	395	360	311	323	303	800	795	760	725	30	29	300	280	258 – 274	38	113	349	310	770	745
1050.500	500	495	460	411	423	303	500	495	460	425	30	17	210	190	168 – 184	38	113	449	410	470	445
1350.500	500	495	460	411	423	303	500	495	460	425	30	17	300	280	258 – 274	38	113	449	410	470	445
1057.500	500	495	460	411	423	303	700	695	660	625	30	25	250	230	208 – 224	38	113	449	410	670	645
1060.500	600	595	560	511	523	500	600	595	560	525	30	21	210	190	168 – 184	38	113	549	510	570	545
1054.500	600	595	560	511	523	500	600	595	560	525	30	21	250	230	208 – 224	38	113	549	510	570	545
1360.500	600	595	560	511	523	500	600	595	560	525	30	21	350	330	308 – 324	38	113	549	510	570	545
1076.500	600	595	560	511	523	500	760	755	720	675	30	27	210	190	168 – 184	38	113	549	510	730	705
1376.500	600	595	560	511	523	500	760	755	720	675	30	27	350	330	308 – 324	38	113	549	510	730	705
1058.500	600	595	560	511	523	500	800	795	760	725	30	29	250	230	208 – 224	38	113	549	510	770	745
1090.500	600	595	560	511	523	500	1000	995	960	925	35	37	250	230	208 – 224	38	113	539	500	955	930
1077.500	760	755	720	671	683	500	760	755	720	675	30	27	210	190	168 – 184	38	113	704	665	730	705
1073.500	760	755	720	671	683	500	760	755	720	675	30	27	300	280	258 – 274	38	113	704	665	730	705
1055.500	800	795	760	711	723	500	600	595	560	525	30	21	300	280	258 – 274	38	113	749	710	570	545
1180.500	800	795	760	711	723	500	1000	995	960	925	35	37	300	280	258 – 274	70	113	739	700	955	930

Compact enclosures AE

Spray-finished



X Door interior view

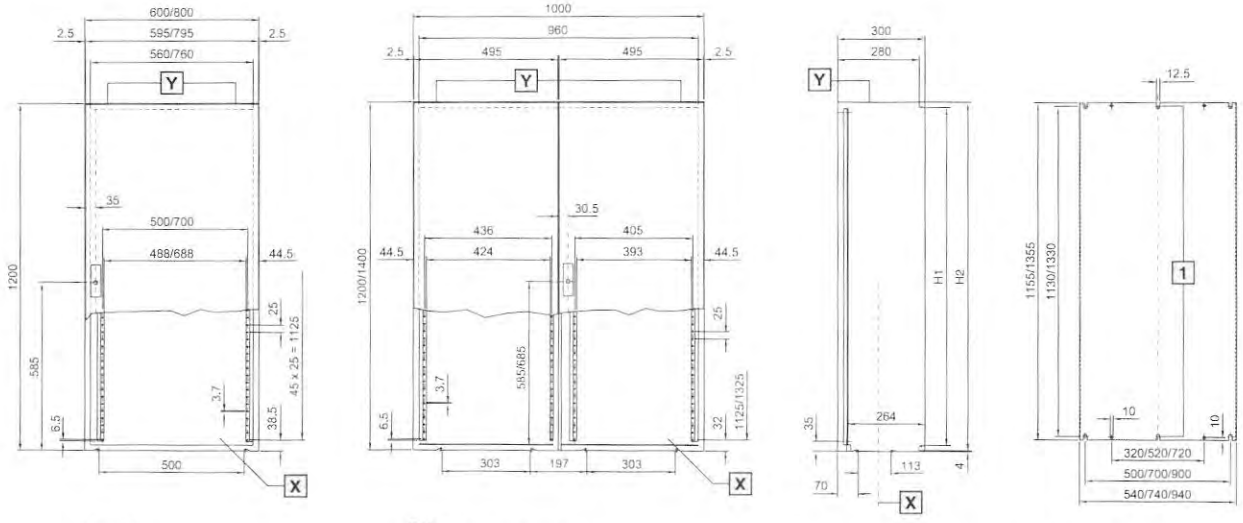
1 AE 1110.500 and AE 1130.500 with holes for eyebolts, view Y, see page 2 below.

i.L. = Clearance width

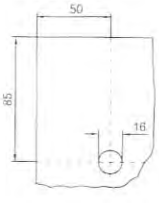
Detail wall-mounting holes, see page 1 at the top.

Model No. AE Spray-finished	H1	H2	H3	H4	H5	H6	H7	H8	H10	N1	N4	T1	T2	T3	T4	F1	F2	G1	G2
1100.500	760	755	720	675	698	660	598	30	575	27	23	210	190	168 – 184	38	944	905	730	705
1130.500	760	755	720	675	698	660	598	30	575	27	23	300	280	258 – 274	70	944	905	730	705
1110.500	1000	995	960	925	938	900	838	35	825	37	33	300	280	258 – 274	70	939	900	955	930

Spray-finished



View Y



X Door interior view

Y Hole for eyebolts

i.L. = Clearance width

Detail of wall-mounting holes, see page 1 at the top.

1 Do not apply to AE 1260.500

Model No. AE Spray-finished	W mm	H mm	i.L. H1 mm	H2 mm	D mm	Door(s)
1260.500	600	1200	1160	1194	300	1
1280.500	800	1200	1160	1194	300	1
1213.500	1000	1200	1160	1194	300	2
1114.500	1000	1400	1360	1394	300	2

ENGLISH

Datasheet

RS Pro OFF Delay Single Time Delay Relay, Screw, 0.3 s → 30 h, SPDT, 1 Contacts, SPCO, 24 V ac/dc, 240 V ac

RS Stock No: **896-6822**

Product Details

RS Pro OFF delay single time delay relay is a dual voltage, single function timer. This relay is compact in size and suitable for DIN rail mounting. It comes with a terminal screw type and it has a time range of 0.3 s to 30 h with SPDT and SPCO switch configuration. It has 1 contact and supply voltage of 24 V ac/dc and 240 V ac.

Features and Benefits

- 17.5 mm wide
- DIN rail mounting
- Integrated dual voltage
- On delay timing function
- LED indications for power and relay status
- SPCO output relay
- 0.3 s to 30 hours timing range
- Wide supply voltage range
- IP20 (terminals), IP40 (enclosure) protection

RS, Professionally Approved Products, gives you professional quality parts across all products categories. Our range has been testified by engineers as giving comparable quality to that of the leading brands without paying a premium price.

ENGLISH

Specifications:

Number of Timer Functions	Single
Power Supply	External
Switch Configuration	SPCO
Time Increment	Seconds
Depth	58.5 mm
Length	17.5 mm
Maximum Operating Temperature	+55°C
Minimum Operating Temperature	-10°C
Number of Contacts	1
Width	90 mm
Contact Configuration	CO
Current Maximum	5 A
Current Minimum	0.1 A
Maximum Voltage	24 V ac/dc, 240 V ac
Mode of Operation	Off Delay
Mounting Type	DIN Rail
Supply Voltage	24 V ac/dc, 240 V ac
Terminal Type	Screw
Time Delay	100 ms
Time Range	0.3 s to 30 h
IP Rating	IP20, IP40

RS, Professionally Approved Products, gives you professional quality parts across all products categories. Our range has been testified by engineers as giving comparable quality to that of the leading brands without paying a premium price.

PERIMETER
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TapCo Wrong Way Detection System

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(615) 953-8872 main ◆ (615) 468-6311 fax ◆ (844) 277-8586 service

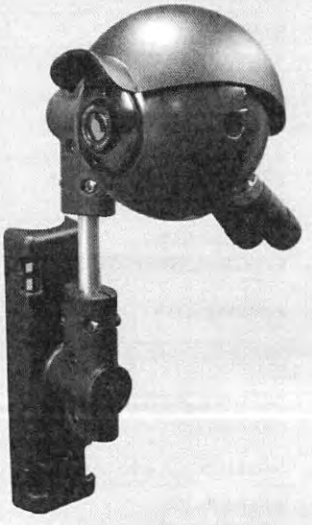
TAPCO®
Safe travels.

WRONG-WAY VEHICLE THERMAL SENSOR

SPECIFICATIONS

POWER INPUT	12 to 42V DC		
POWER CONSUMPTION	3.6 watts; running 4.8 watts; start up		
SENSOR OPTIONS	**LENS TYPE**	**FIELD OF VIEW**	**DETECTION DISTANCE**
	35°	Horizontal: 35° Vertical: 27°	50 to 245 feet
	45°	Horizontal: 45° Vertical: 35°	16 to 160 feet
	90°	Horizontal: 90° Vertical: 69°	0 to 85 feet
DETECTION ZONES	4 to 6 lanes of visibility*		
INSTALLATION HEIGHT	11.5 to 39.4 feet; dependent upon number of lanes to monitor and location of sensor		
THERMAL SENOR DETECTOR TYPE	Long wave infrared (7 to 14 um)		
CONFIGURATION	Ethernet		
CONNECTORS	Ethernet 8-pole connector Power 4-pole connector		
HOUSING	Aluminum with sunshield		
BRACKET	Aluminum, horizontal or vertically fixed with banding straps		
ENCLOSURE	IP-67 rated		
MATERIALS	All weatherproof UV-resistant		
SHOCK & VIBRATION	NEMA TS2		
FCC	FCC part 15 class A		
OPERATING TEMPERATURE RANGE	-29°F to 165°F (-34°C to 80°C)		
DIMENSIONS (INCLUDING BRACKET)	Horizontally mounted: 9.1"W x 10.6"H x 4.8"D Vertically mounted: 6.8"W x 12.9"H x 4.8"D		

** Dependent upon camera lens type*



(800) 236-0112 TAPCOnet.com

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1026-01028 04/10/19

TAPCO
Safe travels.

IWS CONTROLLER

SPECIFICATIONS

POWER	6V and 12VDC with power indicator light
INPUTS	2 digital inputs
OUTPUTS	2x two-channel (able to drive two warnings per output)
PROGRAMMABILITY	Locally using serial input (RS232) or remotely using BlinkLink® via cell modem
PROGRAM ACTIVATION OPTIONS	24/7, Dusk 'til Dawn, BlinkLink® Scheduling, Time Clock, Custom Input
LED-WARNING CONTROL COMPATIBILITY	BlinkerSign®, BlinkerBeacon™, RRFB-XL2™
DIMMABILITY	Auto-adjustable via solar panel (6V systems) Auto-adjustable via photocell sensor (12V systems)
INTERNAL SYSTEM CLOCK	Integrated with on-board battery backup
SELF-DIAGNOSTIC CAPABILITY	Internal temperature monitor
DAYLIGHT SAVING TIME	User programmable
OPERATING TEMPERATURE RANGE	-40°F to 176°F (-40°C to 80°C)
ENCLOSURE	IP67 rated
ENCLOSURE DIMENSIONS	3.2"W x 3.7"H x 2.5"D

TAPCO (800) 236-0112 TAPCOnet.com

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1026-010000 08-07-2018

Evo*SIGNAL* **Midi** - Horns & Sirens

Base mounting

Tube mounting

Bracket mounting

ⓘ TECHNICAL SPECIFICATIONS/ORDER SPECIFICATIONS

Dimensions (Ø x Height):	85 mm x 78 mm	
Housing:	PC/ABS	
Lens:	PC, grey	
Fixing:	Base/Tube/Wall mounting	
Cable entry:	Cable diameter 8-12 mm	
Connection:	Pusch-In terminal max. 1.5 mm²	
Tone type:	Multi-tone	
Tone frequency:	3300 Hz	
Voltage:	12/24 V AC/DC	115-230 V AC
Current consumption:	≤ 175 mA	≤ 105 mA
Order no.	**161 700 70**	**161 700 60**

♪ TONE TYPES AND FREQUENCIES

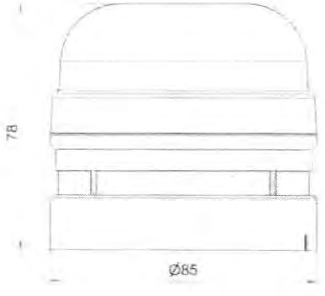
10 selectable tones and adjustable sound output

Tone	Tone type
0	Horn tone (ca. 110 Hz), max. 107 dB(A)
1	Continuous tone (ca. 3.3 kHz), max. 106 dB(A)
2	Pulse tone 1 Hz (ca. 3.3 kHz), max. 110 dB(A)
3	Whistle tone 20 Hz (ca. 3.3 kHz), max. 110 dB(A)
4	800 – 970 Hz rising @ 1 Hz, max. 95 dB(A)
5	2400 - 2850 Hz rising @ 7 Hz, max. 99 dB(A)
6	1200 – 500 Hz falling @ 1 Hz, max. 101 dB(A)
7	Alternating tone 800 Hz / 1200 Hz @ 1 Hz, max. 100 dB(A)
8	Sweep-Tone 2100 – 4100 Hz @ 0.5 Hz, max. 110 dB(A)
9	Continuous tone (c. 700 Hz), max. 97 dB(A)

🛠 ACCESSORIES:

Base mounting	**261 700 01**
Base mounting with cable gland	**261 700 02**
Tube mounting	**261 700 05**
Bracket mounting	**261 700 07**
Bracket mounting with cable gland	**261 700 06**
Horn	**261 700 03**

↔ TECHNICAL DIAGRAM



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Signalisation index
Midi 8

Evo*SIGNAL* **Midi** - LED Signal Beacon

Bracket mounting

Tube mounting

ⓘ TECHNICAL SPECIFICATIONS/ORDER SPECIFICATIONS:

Dimensions (Ø x Height):	85 mm x 130 mm	
Housing:	PC/ABS, grey, high impact	
Lens:	PC, transparent	
Fixing:	Base/Tube/Wall mounting	
Cable entry:	Cable Diameter 8-12 mm	
Connection:	Push-In terminal max. 1.5 mm²	
Twin*LIGHT*		
Blinking/Flash frequency:	1 Hz	
Voltage:	12/24 V AC/DC	115-230 V AC
Current consumption:	≤ 185 mA	≤ 65 mA
red	**261 110 70**	**261 110 60**
green	**261 210 70**	**261 210 60**
yellow	**261 310 70**	**261 310 60**
white	**261 410 70**	**261 410 60**
blue	**261 510 70**	**261 510 60**
Twin*FLASH*		
Blinking/Flash frequency:	1 Hz	
Voltage:	12/24 V AC/DC	115-230 V AC
Current consumption:	≤ 850 mA	≤ 110 mA
red	**261 120 70**	**261 120 60**
green	**261 220 70**	**261 220 60**
yellow	**261 320 70**	**261 320 60**
white	**261 420 70**	**261 420 60**
blue	**261 520 70**	**261 520 60**
Rotation		
Rotation rate:	180 r.p.m.	
Voltage:	12/24 V AC/DC	115-230 V AC
Current consumption:	≤ 130 mA	≤ 110 mA
red	**261 140 70**	**261 140 60**
green	**261 240 70**	**261 240 60**
yellow	**261 340 70**	**261 340 60**
white	**261 440 70**	**261 440 60**
blue	**261 540 70**	**261 540 60**
Tri*COLOUR*		
Voltage:	12/24 V AC/DC	115-230 V AC
Current consumption:	≤ 145 mA	≤ 50 mA
clear	**261 430 70**	**261 430 60**

✕ ACCESSORIES:

Base mounting	**261 700 01**
Base mounting with cable gland	**261 700 02**
Tube mounting	**261 700 05**
Bracket mounting with cable gland	**261 700 06**
Bracket mounting	**261 700 07**
Horn	**261 700 03**

↔ TECHNICAL DIAGRAM:

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PERIMETER
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Overhead Display

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PRODUCT ID: 18723

Outdoor Blank-out LED Direct-view Sign

MODEL

TCL734RR-B327/12-24VDC

DIMENSIONS

7" H x 34" W x 2.5" D (est. 6.821 lbs)

CLASS

CLASS: TCL Series
Control Method: Switch (not included) or external relay.

CONSTRUCTION

Cabinet: 1-piece, corrosion resistant, extruded all-weather frame, 2.5" deep.
Face Material: 1/8" impact resistant, smoke-tinted polycarbonate (5109)
Faces: Single Faced Sign
Finish: Duranodic Bronze
Mounting Channel: None

ELECTRICAL

Flashing: Not Included
Input Voltage: 12-24 VDC
UL/cUL Listed: Listed for wet locations

MESSAGE

Illumination: Super bright direct view LEDs. Message blanks out when off.
Sign Messages: See message table below

MESSAGE	LED/COLOR	HEIGHT	AMPS
OVER SPEED	Red Wide Angle LED	3.5"	0.693-0.347
WRONG WAY	Red Wide Angle LED	3.5"	0.680-0.340

NOTE: Above messages are independently controlled.

Signal-Tech
4985 Pittsburgh Ave.
Erie, PA 16509
Phone: (877) 547-9900
Fax: (814) 835-2300
Email: sales@signal-tech.com
Website: www.signal-tech.com

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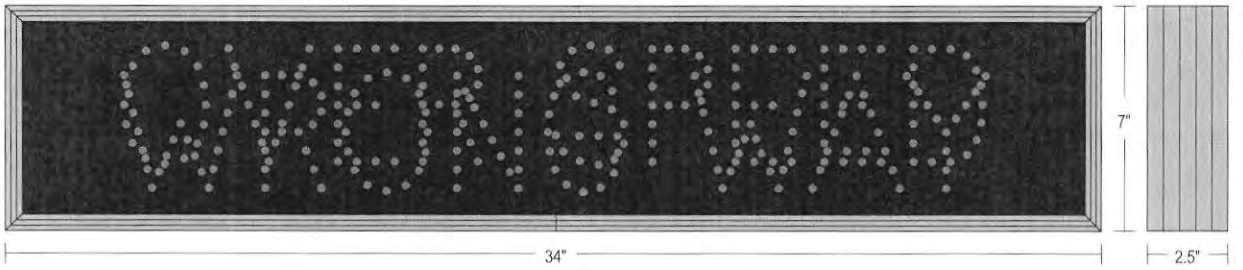
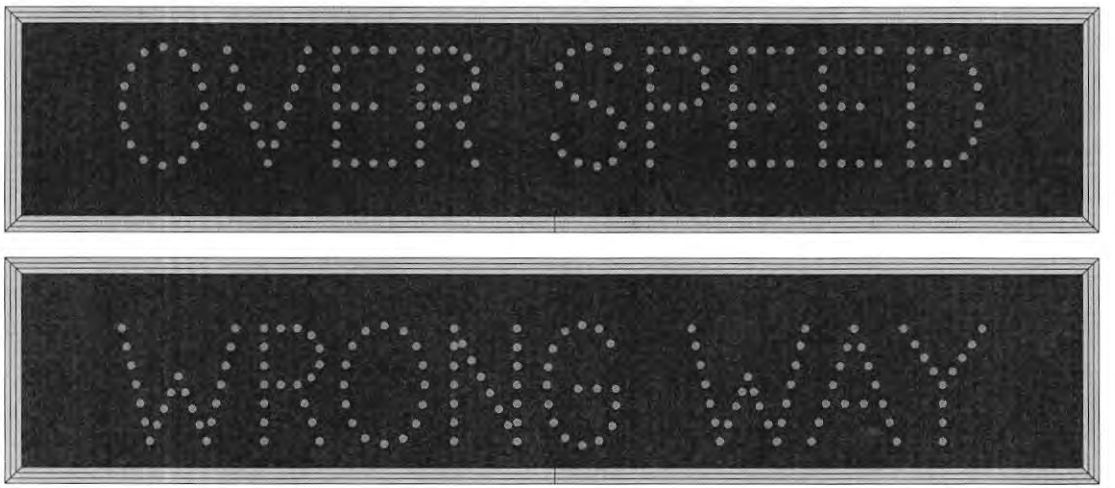
Product View

NOTE: Sign image may not exactly represent the finished product. For illustration purposes only.



Sample Display Options



PERIMETER
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Uninterrupted Power Supply

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SDU AC -A Series, DIN Rail UPS

The SDU AC - A Series DIN Rail UPS combines an industry leading compact design with a wide operation temperature range, enhanced communication and unique installation options. The SDU series provides economical protection from damaging impulses and power interruptions. These units include easy to wire screw terminations for critical devices needing battery back up such as computer based control systems.

c UL us CE FC
E179213

Applications

- Programmable Logic Controllers
- Factory Automation
- Robotics
- Conveying Equipment
- Computer-based Control Systems

Features

- Lightweight, compact industrial design
- Communications port for optional Industrial Ethernet protocols or discrete communication card
- Wide operation temperature range (0 °C to 50 °C)
- Cold start capability
- Software and cable included for easy installation
- Simulated sinewave output
- USB communication port
- Remote turn-on and shutdown capabilities
- Two year limited warranty
- Panel/wall mounting brackets (optional)

Certifications and Compliances

- CE
  - Low Voltage Directive: EN62040-1
  - EMC Directive: EN62040-2
- Class 1 Division 2 - ANSI ISA 12.12.01/CSA 213 Pending
- RoHS Compliant
- c UL us UL Recognized Component, UPS Equipment
  - UL 1778 5th Ed., CSA C22.2 No. 107.3
  - Suitable for UL 508 at full load output (no derating) and Ind. Control Equipment Applications
  - CSA C22.2 No. 107.1
  - Overvoltage Cat III, Pollution Degree III
  - ODVA Compliant
    EtherNet/IP™ SDUENETIPCARD has been tested and approved for conformance by the ODVA. More information about EtherNet/IP™ and the ODVA can be obtained from the following website: www.odva.org.

Related Products

- Portable MCR Power Conditioners
- STV Surge Protective Devices
- SDN DIN Rail Power Supplies
- STFV Plus Active Tracking® Filters

Selection Table

Catalog Number	Capacity (VA/W)	Volts, Frequency In/Out	Typical Back–Up Time (minutes) At full load/half load.	Input/Output Connections	Approx. Ship Weight – lbs (kg)
SDU 500A	500/300	120 Vac, 50/60 Hz	4/18	IP20 touch proof, screw terminals. Wire range: 10 ~ 18 AWG.	10.6 (4.8)
SDU 850A	850/510		2/10		11.5 (5.2)
SDU 500A-5	500/300	230 Vac, 50/60 Hz	4/18		10.6 (4.8)
SDU 850A-5	850/510		2/10		11.5 (5.2)

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Specifications

Catalog Number	SDU 500A	SDU 850A	SDU 500A-5	SDU 850A-5
Capacity (VA/Watts)	500/300	850/510	500/300	850/510
Load Power Factor	0.6			
	Dimensions – inches (mm)			
Unit (H x W x D) – in. (mm)	4.87 x 11.1 x 4.81 (123.7 x 281.9 x 122.3)			
Weight – lbs (kg)	10.6 (4.8)	11.5 (5.2)	10.6 (4.8)	11.5 (5.2)
	Input Parameters			
Voltage	120 V (+10%, -20%)		230 V (+/- 15%)	
Frequency	50 +/- 5 Hz or 60 Hz +/- 6 Hz (auto sensing)			
	Output AC Parameters			
Voltage (Battery Mode)	Simulated sinewave			
	+/- 5%			
Frequency (On Battery)	50 or 60 Hz +/- 0.3 Hz			
Overload Protection	UPS automatic shutdown if overload exceeds: 105% of nominal at 20 seconds, 120% of nominal at 10 seconds, 130% of nominal at 3 seconds			
Short Circuit	UPS shutdown, auto-recovery			
	Battery Parameters			
Battery Type	Sealed, non-spillable, maintenance-free lead acid batteries			
Transfer Time	4 - 6 ms typical			
Back–Up Time (minutes) Full Load/Half Load	4/18	2/10	4/18	2/10
Recharge Time	8 hours to 90% capacity of full discharge			
	Environmental			
Operating Temperature	0 °C to 50 °C			
Storage Temperature	-15 °C to 60 °C			
Relative Humidity	0 to 95%, non-condensing			
Ambient Operation	0-95% humidity non-condensing, 0-50 °C up to 5,000 ft. (1500m)			
Audible Noise	< 40dBA (1 meter from surface)			
	Standards			
EMC	FCC Part 15, Subpart B, Class A Level 4; EMC: EN62040-2; EN55032; CISPR22; EN61000-3-2; IEC61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -2-2			
Elevation	5000 ft. without derating			
Surge Protection	Meets IEEE C62.41, Category A			
Shock	Operating - IEC60068-2-27, Half Sine Wave: 10G for a duration of 11ms, shock for 1 direction (X axis) Non-operating - IEC60068-2-27, Half Sine Wave : 30G for duration of 11ms, 3 shocks for all 3 axes			
Vibration	Operating - IEC60068-2-6, Sine Wave: 10Hz to 500Hz @19.6m/S^2, displacement of 0.35mm, 60 min per axis for all X, Y, Z direction. Non-operating - IEC60068-2-6, Random : 5hz to 500Hz (2.09Grms); 20 min per axis for all X,Y,Z			
Mounting	To be mounted on DIN TS35/7.5 or TS35/15 rail system. Chassis mounting permissible via optional brackets (SDU-PMBRK).			

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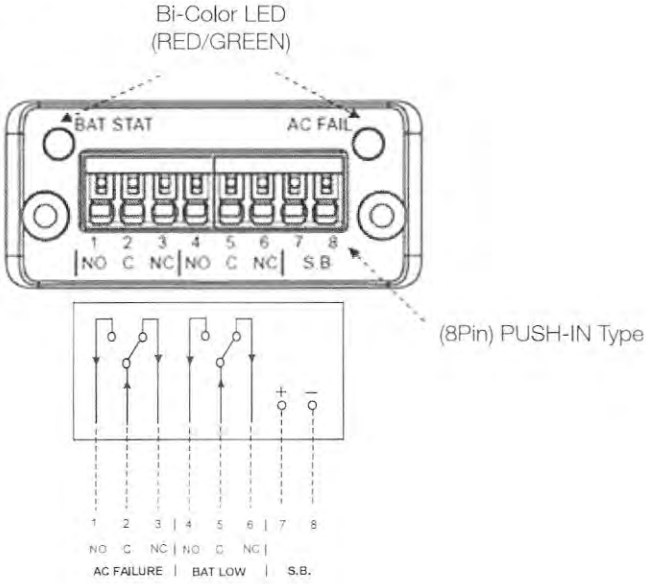
Comm Card Accessories

Active - (Industrial Ethernet)

Passive

Catalog Number	Description	Approx. Ship Weight – oz. (g)
Active - (Industrial Ethernet)		
SDUENETIPCARD	2 Port EtherNet/IP™ COMM CARD	1.0 (28.4)
SDUECATCARD	2 Port EtherCAT COMM CARD	1.0 (28.4)
SDUMBUSCARD	2 Port Modbus® - TCP COMM CARD	1.0 (28.4)
SDUPNETCARD	2 Port Profinet Industrial Protocol COMM CARD	1.0 (28.4)
SDUPWRLNKCARD	2 Port POWERLINK COMM CARD	1.0 (28.4)
Passive		
SDUCFRELAYCARD	SDU CF Dry Contact I/O RELAY CARD	1.0 (28.4)

SDU CF Relay Card Connection Diagram



SDU Accessories

Catalog Number	Description	Approx. Ship Weight – oz. (g)
SDU-PMBRK	Mounting brackets to secure UPS to wall, back of panel or enclosure.	16.0 (454.0)
SDUEDC	Enhanced DIN Clip to secure UPS to DIN rail	1.6 (45.3)

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Comm Card Specifications

Description	Catalog Number	
	SDUCFRELAYCARD	Active Cards (Example: SDUENETIPCARD) *
Input		
Nominal Voltage	+3.3 V ±5 %	
Standby Signal	Active low via normally open momentary switch	
Frequency	50/60 Hz	
Output		
LED Diagnostics	Refer to diagram	Refer to diagram NS = Network Status, MS=Module Status
Relay Logic Signals	Refer to diagram	—
Relay Contact Ratings	60V peak, 1A	—
Case/Enclosure Material	Housing: LCP(Liquid Crystal Polymer) Color: Natural, Thermoplastic,UL 94 V-0	
Weight & Dimensions		
H x W x D, in. (mm)	0.91 x 2.0 x 2.2 (23 x 50 x 55) approximate	
Net Weight, oz. (g)	1.0 (28.4) approximate	
EMC		
mmunity/Emissions	Emission EN 61000-6-4 EN55016-2-3 Radiated emission EN55022 Conducted emission Immunity EN 61000-6-2 EN61000-4-2 Electrostatic discharge, EN61000-4-3 Radiated immunity. EN61000-4-4 Fast transients/burst, EN61000-4-6 Conducted immunity	
Approvals *	EN/IEC 60950-1 ; UL/CSA 60950-1 Pollution Degree 3 ; UL 508 Pollution Degree 3 CSA 107.1; EU ROHS2,China ROHS2	
Temperature °F (°C)	Storage: -40 to +185 (-40 to +85) Operating: -40 to +158 (-40 to +70) Convection cooling; no forced air required.	
Vibration	Operating: IEC60068-2-6, Sine Wave: 10Hz to 500Hz @19.6m/S², displacement of 0.35mm, 60 min per axis for all X, Y, Z direction. Non-Operating: IEC60068-2-6, Random : 5hz to 500Hz (2.09Grms); 20 min per axis for all X,Y,Z direction.	
Shock	Operating: IEC60068-2-27, Half Sine Wave: 10G for a duration of 11ms, shock for 1 direction (X axis). Non-Operating: IEC60068-2-27, Half Sine Wave : 50G for duration of 11ms, 3 shocks for each 3 directions.	
Humidity	0% to 90% RH, noncondensing; IEC 68-2-2, 68-2-3	
Warranty	2 Years	
MTBF (bellcore)	1,968,800 Hours	
General Protection/Safety	Protected against Continuous short -circuit, Continuous overload, Continuous open circuit. Galvanic Isolation: I/P to O/P: 3KVac, I/P to GND: 1.5KVac, O/P to GND: 0.5KVac Protection class 1 (IEC536), degree of protection IP20 (IEC 529) Safe low voltage: SELV (acc. EN60950); ROHS	

* Approvals apply for ActiveCards. Contact Technical support for Passive Cards.

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Nashville, TN 37027
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ARGUS

PERIMETER
SECURITY
PARTNERS

Overspeed and Wrong Way Detection System
Operation and Maintenance Manual

Version 1.0
7.8.20

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INTRODUCTION

The **Argus** is a system for detecting vehicles approaching the entrance to a facility at an unsafe/ threatening speed and vehicles approaching the facility in the outbound lanes. By providing advance warning of a potential approaching threat the **Argus** system gives the guard force the time required to assess and respond to these threats. Detection can be accomplished through a variety of methods including radar, roadway loops, and infrared or visual light cameras with intelligent analytics. When an over speed or wrong way event is detected, the **Argus** system will alert personnel via an overhead display sign and an audible alarm. The **Argus** can also be integrated into an existing alarm system or vehicle barrier control system to provide remote warning at multiple stations.

Operation: Once installed, configured, and turned on the **Argus** continuously scans for over speed and wrong way events – automatically alerting personnel when the adjustable threat parameters are exceeded. No manual operation or user action is necessary.

Installation: The **Argus** interface panel can be installed on any interior or exterior wall can be more than 100' away from the system's detection and warning devices. A single power source is connected to the **Argus** interface panel, which then provides the necessary power and control of all detection and warning devices. Detection devices may be installed on existing buildings, canopy columns, dedicated posts, or embedded in the roadway (loops) with simple connections back to the interface panel.

Maintenance: With no moving parts, periodic maintenance requirements are very minor. Camera and radar sensors should be cleaned and checked to ensure they remain oriented properly, roadway loop sealant should be inspected, power and signal connections should be checked, and warning devices should be tested and cleaned.

SAFETY

As with any traffic control or security device which is used in or near a roadway, care must be taken during the maintenance of the **Argus** sensors to ensure that the safety of both the operator/ maintainer and nearby vehicular traffic is preserved. Due to the risk of electrical shock, **Argus** internal components and wiring should only be maintained/ repaired by a PSP technician or licensed electrician.

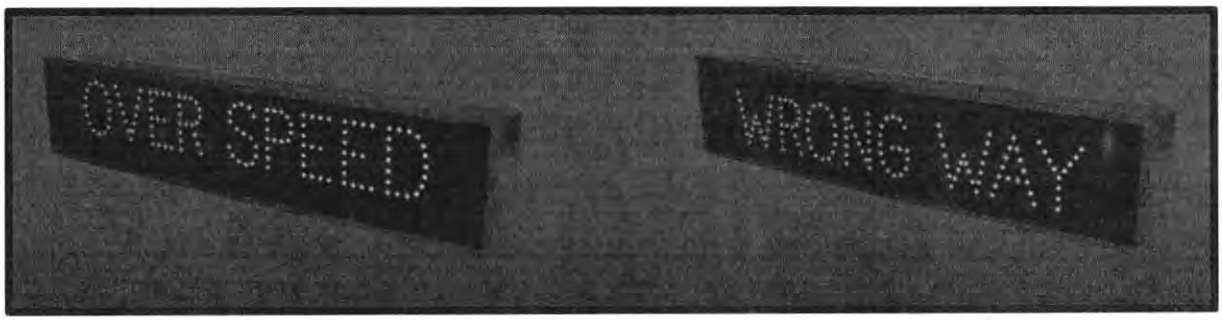
Definitions: The following terms will be used throughout this manual to highlight safety considerations and to provide direction on the safe use of the **Argus** threat detection system.

WARNING – Failure to adhere to instructions marked with this symbol or this term may result in severe injury or death.

CAUTION – Failure to adhere to instructions marked with this symbol or this term may result in injury to personnel or damage to property.

NOTE – Use of this term indicates an important instruction or detail which ensures proper operation or maintenance of the device.

Personnel Protective Equipment: Due to the inherent proximity of installed **Argus** sensors to vehicle traffic, a reflective vest should be worn at all times when maintaining the sensors.



OPERATION

The **Argus** system has been designed to operate without the need for user interaction. Once configured and operational, the system will continuously scan for overspeed or wrong way events and will trigger an overhead display and an audible alarm (or other warning devices, as configured) if an event is detected.

The **Argus** functions in essentially the same way regardless of the type(s) of sensor used. Each sensor is calibrated upon installation to detect a vehicle traveling above a certain speed (over speed event) or in a certain direction (wrong way event). Doppler Radar sensors are calibrated by PSP technicians by plugging into a radar interface in the **Argus** Interface Panel, loop pairs are installed in the roadway at a specific interval and connected to a directional loop detector, and camera systems with intelligent analytics are configured through their proprietary software associated with that sensor.

A signal is sent to the **Argus** Interface Panel by each sensor in the system to indicate if it's preset threshold (speed or direction) has been exceeded, and the **Argus** Interface Panel then activates the appropriate warning devices to alert the guard force. Since a wrong way or over speed event may only generate an instantaneous signal depending on the type of sensor in use, a timing relay is incorporated to ensure that the warning lasts long enough for the guard force to recognize the warning and identify the type of event.

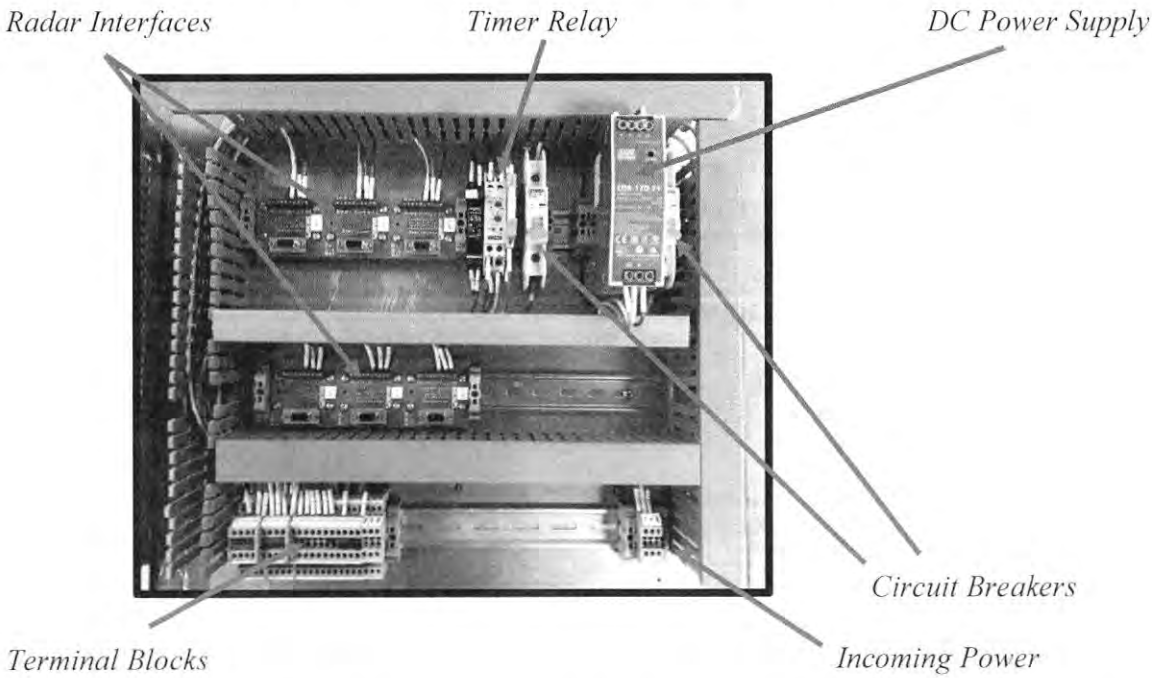
Connections may be made by a PSP Technician between the **Argus** system and other alarm, event recording, or vehicle barrier control systems upon request. Please contact PSP if that is desired.

MAINTENANCE

The **Argus** threat detection system has been designed to provide a lifetime of operation with minimal preventive maintenance or adjustment. To ensure the system maintains proper performance, PSP recommends certain proactive periodic tasks.

WARNING: Due to risk of electrical shock, maintenance of the **Argus** internal components or wiring should only be performed by qualified professionals.

Nomenclature: The following photograph identifies the typical components of the **Argus** interface panel. Please note that exact panel contents are determined by the number and type of sensors incorporated in into the **Argus** system, as well as the power source available for the system.



Preventive Maintenance: PSP recommends that the following actions be completed once every three (3) months or more frequently in the event of severe weather (high winds, ice, or hail in particular) that may affect the orientation or performance of individual sensors.

1. Perform a function check of all sensors.
    a. *Over Speed Sensors (loop pairs, doppler radar, video analytics)*: Close the area to traffic and ensure all personnel are clear of the approach corridor and the guard positions. Ensure all personnel are aware of the test and the requirement to remain clear of the area. Approach the facility entrance in a vehicle traveling approximately 5 MPH faster than the threshold set for that sensor. Verify that all

installed visual and audible warning devices function upon detection, and that the vehicle is detected at the designed location. Slow the vehicle to a normal approach speed as soon as the warning devices are triggered.

WARNING: If the threshold speed for any sensor is set higher than a vehicle can be safely driven without risk to the driver or nearby personnel, contact PSP to perform these function checks by temporarily resetting the threshold speed to a lower, safe speed for testing.

b. *Wrong Way Sensors (loop pairs, doppler radar, video analytics)*: Close the area to traffic and ensure that there is no way outbound traffic can proceed into the area where testing will occur. Approach the facility entrance in a vehicle traveling approximately 10 MPH in the outbound lane(s). Verify that all installed visual and audible warning devices function upon detection, and that the vehicle is detected at the designed location. Safely resume travel in the proper direction as soon as possible after the warning devices are triggered.
c. *Warning Devices (indicator lights, display boards, audible alarms)*: During the over speed and wrong way sensor tests ensure that all visual warning devices are functional, that they are clearly readable, and oriented properly. Ensure that audible alarms are loud enough to be heard, that distinct tones for over speed and wrong way events are used, and that the duration of the alarm coincides with the duration of the visual display.

2. Adjust radar and camera sensors as required if functional checks identify that they are not picking up approaching vehicles or are not detecting vehicles at the proper location. Repeat the functional test until the proper detection parameters are achieved.
3. Clean all radar sensors and cameras. Using a moist, soft cloth (do not use solvents or cleaning agents without first verifying that the solvent will not cloud camera lenses) wipe clean all surfaces, paying particular attention to camera lenses and/or radar and camera enclosures.
4. If equipped with cameras, vacuum out the pole-mounted control cabinet.
5. Clean all visual displays. Using a moist, soft cloth (do not use solvents or cleaning agents without first verifying that the solvent will not cloud displays) wipe clean all surfaces.
6. Inspect all mounting hardware. Verify that all adjustment and mounting hardware for radar sensors, visual displays, audible alarms, and camera sensors are secure and prevent inadvertent movement of the sensors in particular.
7. Inspect all electrical connections and ensure that they are secure.
8. Inspect all loop sealant for each roadway loop to ensure that there are no exposed wires (to include lead wires), missing sealant, or dry and cracked sealant.

Adjusting Timing: The only adjustable electrical component in the **Argus** Interface Panel is the timer relay. It has two red dials: one for activation delay, the other for duration of signal. The activation delay (bottom) can be between .1s and 1s, is set at installation and should not be adjusted. The duration of signal (how long the warning devices are active after an event is detected) can be set between .3s and 30 hours by using a Philips head screwdriver to turn the upper red dial. PSP recommends no less than 3 seconds and no more than 10 seconds.

PRODUCT SUPPORT

For replacement parts, repair service, or to purchase additional **Argus** detection systems, contact *Perimeter Security Partners, LLC* via any of the following methods:

Mail: Perimeter Security Partners, LLC
5038 Thoroughbred Ln.
Nashville, TN 37027

E-Mail: service@perimetersecuritypartners.com
sales@perimetersecuritypartners.com

Phone: 1-615-953-8872

24/7 Service: 1-844-277-8586

Website: www.perimetersecuritypartners.com

FLIR

User Manual
TRAFISENSE2

R3.00, V2.01.P01

User Manual
TRAFISENSE2

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EMC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notwithstanding the fact this equipment is intended to be used in business, industrial and commercial environments, it has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a business, industrial and commercial environment as well as in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

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6769 Hollister Ave
Goleta, CA 93117 USA
Phone: (805) 964-9797
FAX: (805) 685-2711
E-mail: Paul.Wills@flir.com

NOTE

Product must be connected with following cables or electrical equivalent:

- Power cabling sensors : Installation cable 3 wires or equivalent
- Ethernet cabling to sensor : UTP Cat5e or equivalent

CAUTION

The integrity of the functional earth connection must be ensured for BPL interfaced installations where over voltages are typically expected. Use short as possible and rigid earth connection.

Related hardware and firmware

Part number	Description	Hardware version	Firmware version
10–7470	TrafiSense2 690	R03.00	V2.01.P01
10–7474	TrafiSense2 645	R03.00	V2.01.P01
10–7476	TrafiSense2 632	R03.00	V2.01.P01
10–7013	TI BPL2 EDGE	R01.10	V1.01
10–4675	4I/O USB	R01.00	
	Public API		V1.04

Normative compliance

Regulatory

	TrafiSense2	TI BPL2 EDGE and 4I/O USB
US Federal Regulations	• FCC Title 47	• FCC Title 47
Product standards	• NEMA TS2	• NEMA TS2

Environmental

	TrafiSense2	TI BPL2 EDGE and 4I/O USB
Temperature	• Operating: -40°C to +74°C • Storage: -40°C to +74°C	• Operating: -34°C to +74°C • Storage: -34°C to +74°C
Mechanical integrity	• NEMA TS2 : Shock immunity 10G • NEMA TS2 : Vibration immunity	• NEMA TS2 : Shock immunity 10G • NEMA TS2 : Vibration immunity
Electrical integrity	• NEMA TS2 : EM Immunity • FCC Part 15 : EM Emission Class B	• NEMA TS 2 : EM Immunity • FCC Part 15 : EM Emission Class B

Product usage

CAUTION

- FLIR Intelligent Transportation Systems accepts no liability for claims from third parties arising from improper use other than that stated in this manual.
- Although considerable care has been taken to ensure a correct and suitably comprehensive description of all relevant product components, this manual may nonetheless contain errors and inaccuracies. We invite you to offer your suggestions and comments by e-mail via flir@flir.com.Your feedback will help us to further improve our documentation.
- Do not use corrosive or abrasive means for product treatment. These may cause damage or degrade product performance and lifetime.

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1 Before you start: safety measures

1.1 General safety measures

To avoid bodily harm or product damage, take care of the following safety measures:

WARNING

If there is any doubt regarding the safety of the equipment, do not put it into operation.

WARNING

Do not disassemble the product nor remove screws or covers to prevent injury or electric shock. Product should be serviced by FLIR qualified personnel only.

WARNING

Handle the product with care, avoid bumping and shaking. The product can be damaged by improper handling or storage causing safety hazards.

WARNING

Using the product within operating temperature range may cause the surface to become extremely hot or cold. Handle with proper precaution.

WARNING

This product should only be used on altitude below 2000 m or 6560 ft with respect to sea level.

WARNING

This product is to be installed and configured by instructed or skilled personnel only.

WARNING

Power supply shall be derived from nominal mains (earth referenced) not exceeding 250Vrms.

WARNING

Power supply shall have basic insulation to nominal mains withstanding 2500Vpeak and secondary circuit reliably connected to earth OR reinforced insulation to nominal mains withstanding 4000Vpeak with no further requirements.

WARNING

BPL installation cables shall have sufficient electrical insulation withstanding voltages up to 2500Vpeak unless external measures ensure lower maximum transients.

WARNING

Ethernet installation cables shall have sufficient electrical insulation withstanding voltages up to 1500Vpeak unless external measures ensure lower maximum transients.

WARNING

Dry contacts installation cables shall have sufficient electrical insulation withstanding voltages up to 1500Vpeak unless external measures ensure lower maximum transients.

WARNING

Dry outputs must be connected using paired conductors

WARNING

Installation cables and/or wires exposed to daylight shall be UV resistant.

WARNING

Installation cables and / or wires shall be protected and/or mechanically appropriate to the environment of installation to ensure safety.

WARNING

If no over-current protecting interface is used like any FLIR interface or a PoE injector, power sourcing and device installation cables and / or wires shall externally be provided with double pole very fast acting (FF) over-current protection means maximum rated 1,6 Ampere effective appropriate to wiring and power supply used.

WARNING

Power source shall be over-current protected reducing short circuit currents below 1000Apeak.

WARNING

This equipment is not suitable for use in locations where children are likely to be present.

WARNING

An all pole circuit suitable power switch with contact separation of at least 3mm shall be incorporated external to the equipment.

NOTE

This product is ingress protected to level IP67.

1.2 Safety measures specific to TI BPL2 EDGE

WARNING

The equipment must be powered by either:

- A supply separated from mains with basic insulation withstanding 2500V and with the secondary supply circuit directly and reliably connected to earth
- A supply separated from mains with double insulation withstanding 2500V for each insulation layer
- A safety extra low voltage (SELV) supply

WARNING

Primary mains supply voltage shall be reliably connected to earth and not exceed 300Vrms.

WARNING

Secondary supply working current shall be limited to 20A and the expected short circuit current shall not exceed 1000A.

WARNING

This product is to be installed and configured in a service access area by qualified service personnel only.

⚠ WARNING

Power sourcing and device installation cables and / or wires with current capacity less than 4 Ampere effective shall be provided with very fast acting (FF) external over-current protection device appropriate to wiring and power supply used.

⚠ WARNING

All installation cables and/or wires shall have sufficient electrical insulation withstanding voltages up to 2500Vpeak unless external measures ensure lower maximum transients.

⚠ WARNING

A readily accessible power supply disconnect device shall be incorporated external to the equipment.

⚠ WARNING

Maximum current to protective earth drawn by any line of floating power supply, if used, shall not exceed 3,5mA.

⚠ WARNING

User is to disconnect all telecommunication network connectors before disconnecting earthed power supply.

⚠ WARNING

The equipment is to be installed in climate conditions preventing condensation or an outdoor enclosure rated IP54 or better.

2 Architecture of a TrafiSense2 system, connected as BPL

2.1 Overview of a TrafiSense2 BPL (Broadband over Power Line) system

In a BPL (Broadband over Power Line) installation, the TI BPL2 EDGE interface is placed in the controller cabinet and serves as the interface between TrafiSense2 and the traffic light controller. Maximum 8 TrafiSense2 units can be connected to a single TI BPL2 EDGE. Up to 4 TI BPL2 EDGE units can be used in a cabinet. All interfaces require a different key and a different IP address. The sensors have the same IP-address of the corresponding interface, but unique ports will allow all sensors to be unique and separately accessible.

When more than 4 outputs are needed in TS 1 mode, one or more 4I/O USB expansion boards can be added.
TrafiSense2 can also be used in TS 2/ATC controllers via PIM module.

The PC is connected to the TrafiSense2 via TI BPL2 EDGE. This connection, on site or remote, allows you to set up the system or view streaming video from the TrafiSense2.

2.2 1 to 8 TrafiSense2 devices + TI BPL2 EDGE interface

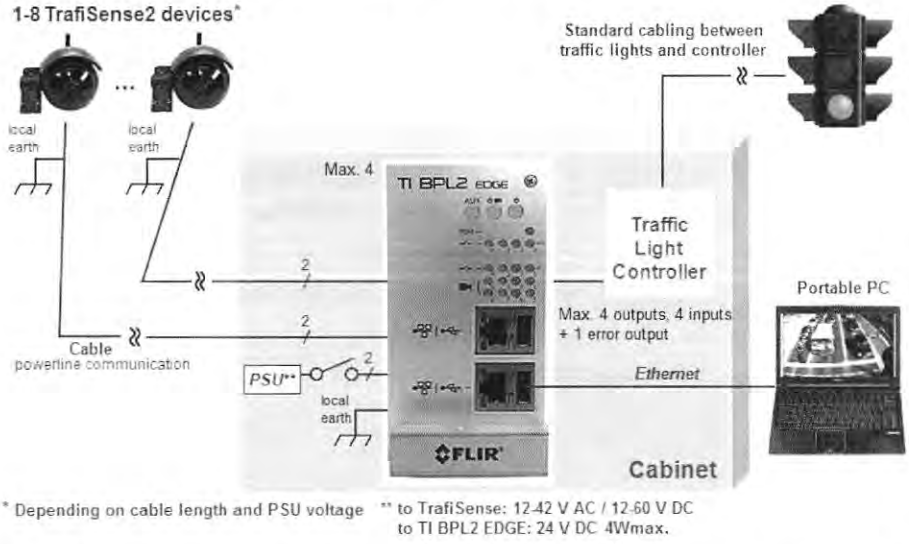


Figure 2.1 System architecture: BPL installation of 1 to 8TrafiSense2 devices with TI BPL2 EDGE interface

2.3 1 to 8 TrafiSense2 devices + max. 4 TI BPL2 EDGE interface

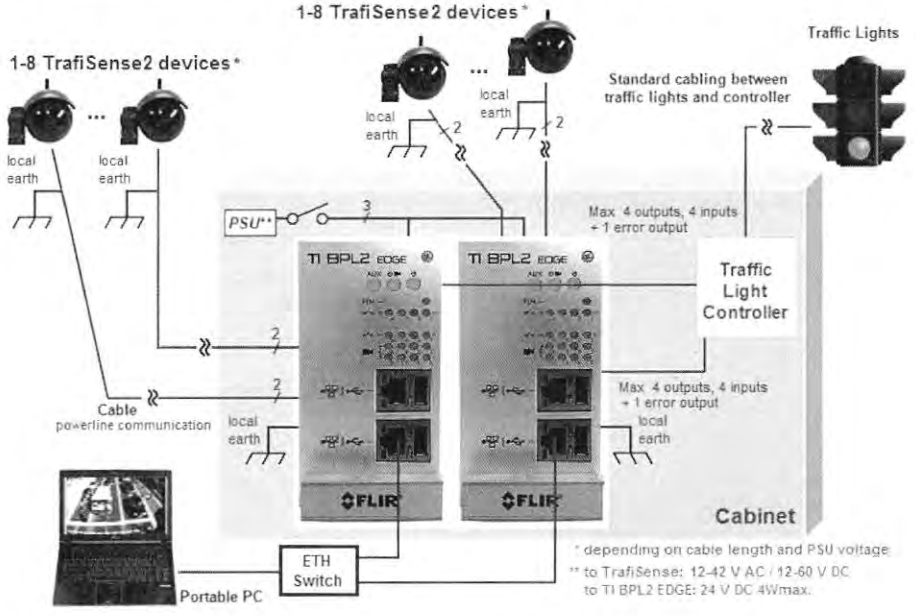


Figure 2.2 System architecture: BPL installation of 1 to 8 TrafiSense2 devices with maximum 4 TI BPL2 EDGE interfaces

2.4 1 to 8 TrafiSense2 devices + max. 4 TI BPL2 EDGE interfaces + 4 I/O USB boards (max. 5)

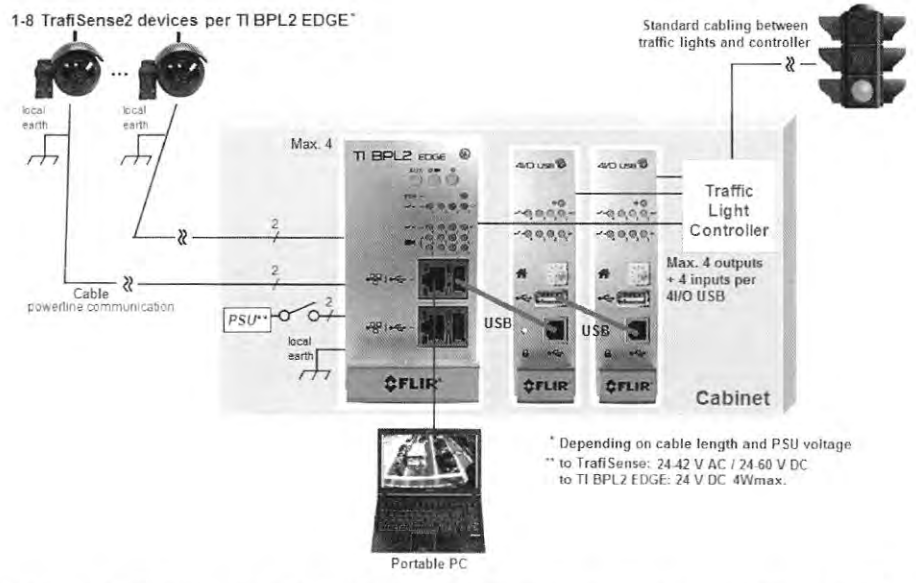


Figure 2.3 System architecture: BPL installation of 1 to 8 TrafiSense2 devices with max. 4 TI BPL2 EDGE interfaces and 4 I/O USB boards (max. 5)

2.5 1 to 8 TrafiSense2 devices + TI BPL2 EDGE and PIM module

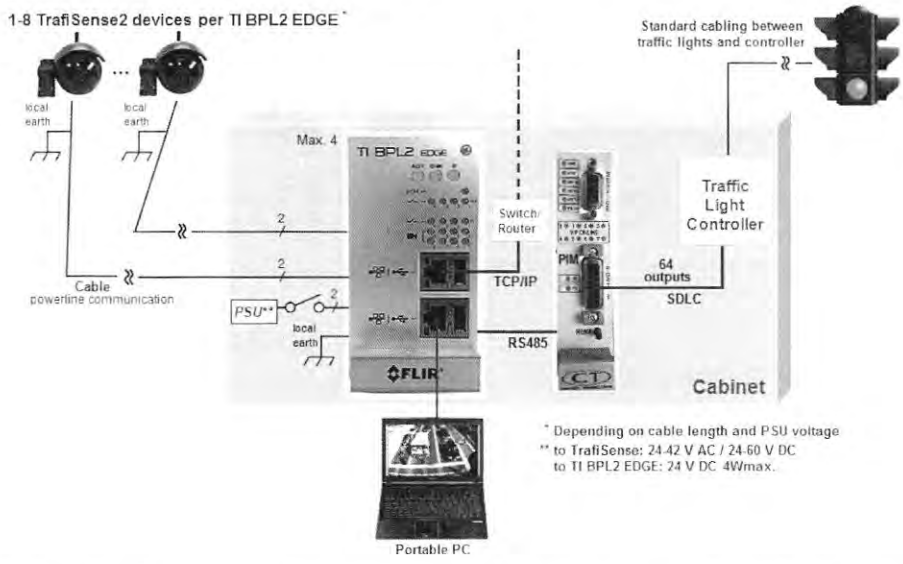


Figure 2.4 System architecture: BPL installation of 1 to 8 TrafiSense2 devices with TI BPL2 EDGE interface and PIM module

3 Architecture of a TrafiSense2 system, connected as PoE

3.1 Overview of a TrafiSense2 PoE (Power over Ethernet) system

The FLIR PoE Interface is placed in the controller cabinet and serves as the interface between TrafiSense2 and the traffic light controller. Maximum 1 TrafiSense2 unit can be connected to a single FLIR PoE Interface via RJ45 port or via the terminal block. Multiple FLIR PoE Interface units can be used in a cabinet.

The PC is connected to the TrafiSense2 via the FLIR PoE Interface. This connection, on site or remote, allows you to set up the system or view visual and/or thermal streaming video from the TrafiSense2.

3.2 PoE installation with off-the-shelf PoE injector

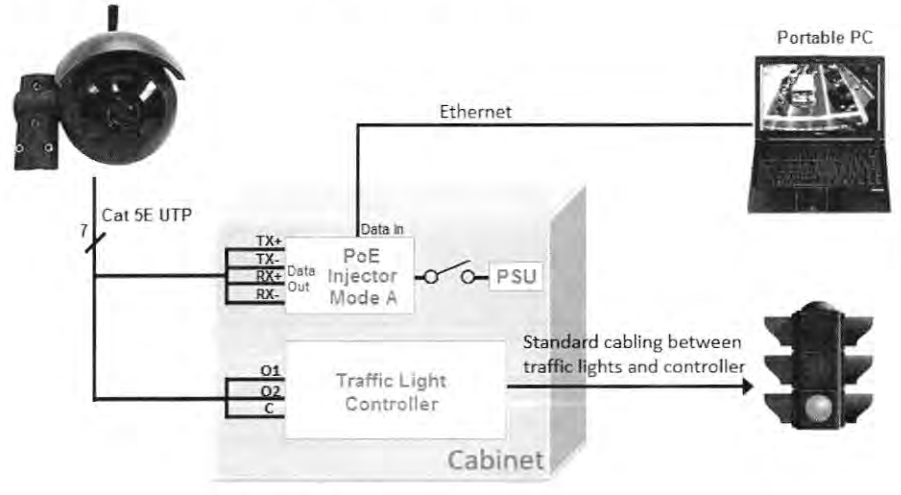


Figure 3.1 System architecture: PoE installation with off-the-shelf PoE injectors in mode A

4 System components

4.1 Components overview

- TrafiSense2
- Mounting accessories
- Connector
- TI BPL2 EDGE
- 4I/O USB (optional)
- PIM module (optional, not provided by FLIR Intelligent Transportation Systems)
- Third party PoE injector
  Note that the outputs cannot be used.

  The following off-the-shelf PoE injectors can be used in mode A.

  - Active injectors :
    - Linksys LACPI30 (Operating temperature 0° C to 40° C)
    - Phihong POE21W-1AF (Operating temperature 0° C to 40° C)
    - Vivotek AP-FIC-010A-015 (Operating temperature 0° C to 40° C)
  - Passive injectors :
    - Phihong POE29U-560 (Operating temperature -20° C to 50° C)

⚠ CAUTION
Product supporting devices such as Power supplies, PoE injectors, Ethernet switches etc. should be suitable for the environment in which they are used. Using recommended supporting devices does not guarantee a safe and reliable installation. Always follow the manufacturer's instructions.

4.2 The TrafiSense2 device

4.2.1 Available lens types

The table below lists the available products, based on the lens type.

Product Reference Number	TrafiSense2 lens
10-7470	TrafiSense2 690
10-7474	TrafiSense2 645
10-7476	TrafiSense2 632

For more information on lens selection, see 5.1 *Selecting the right lens*, page 15.

4.2.2 *TrafiSense2 parts*

The TrafiSense2 device consists of the following parts:

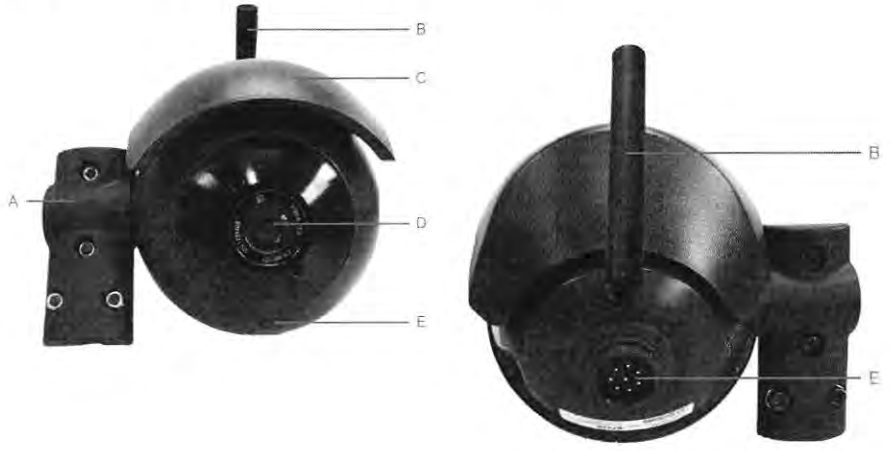


Figure 4.1 Front and back view of TrafiSense2

A. Mounting bracket for the sensor
B. Wi-Fi antenna
C. Sunshield
D. Lens
E. LED
F. Connector (to the TI BPL2 EDGE interface)

⚠ CAUTION
The sun-shield must be used to ensure minimum product lifetime.

4.2.3 *LED indicator code*

The table below illustrates the LED indicator code.

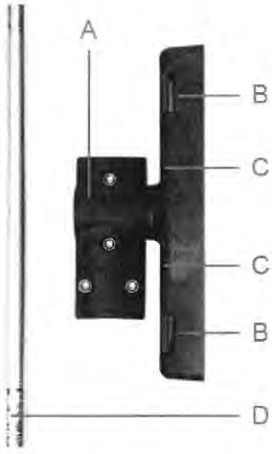
LED	Indication
On (off)	Vehicle presence detection (no detection)
Flashing	TrafiSense2 in boot mode
Single flash	Failsafe mode - detection quality recall
Double flash	Failsafe mode - thermal quality recall
Triple flash	TrafiSense2 is learning (startup recall) or no outputs assigned
Off (permanently)	No power or hardware failure

4.3 The mounting accessories

There are 2 mounting brackets:

- Mounting bracket for the TrafiSense2 device (see Figure 4.1 *Front and back view of TrafiSense2*, page 9.)
- Mounting bracket to the pole as described below.

The tube connects both brackets.



A. Mounting bracket to the pole
B. Holes to put the retaining straps through
C. Holes to mount TrafiSense2 using bolts (M8)
   The screws to tighten after TrafiSense2 has been positioned are located on the backside of the mounting bracket.
D. Tube

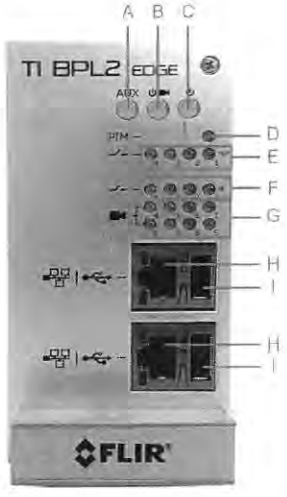
Figure 4.2 The mounting accessories

4.4 Cable connector

A. Cable gland nut
B. Cable holder with cable gland nut (A)
C. 8 pole connector
D. Fixation ring

4.5 TI BPL2 EDGE

NOTE
TrafiSense2 is not compatible with TI x-stream EDGE (10–6055) !



A. **Aux button and LED**

- Short push (< 1s) : Disable/Enable Wi-Fi in the connected sensors. This will also disable/enable a possible Wi-Fi stick in the USB port.
- LED off : Wi-Fi off
- LED green : Wi-Fi on
- LED red : Wi-Fi error

B. **Fuse button and LED**

- Long push (> 1s) : Reset sensor or sensor fuses
- LED green : Fuses OK
- LED red : Fuse error

C. **Power button and LED**

- Long push (> 1s) : Reset TI BPL2 EDGE
- LED off : No power
- LED green : Power OK
- LED red flashing : Interface rebooting

D. **PIM LED**

- LED off : no PIM allocated in configuration
- LED green : PIM operational
- LED red : Communication between PIM and interface not OK

E. **Detection output LEDs (1–4)**

- LED off : output contact open
- LED green : output contact closed

F. **Input LEDs (1–4)**

- LED off : no input
- LED green : input

G. **Sensor status LEDs (1–8)**

- LED off : no sensor allocated
- LED green : sensor operational
- LED red : no communication. Possible causes :
  - sensor in error
  - no power
  - sensor reboot
  - start-up

H. **LAN connector**

- Green LED on/off : Connection to network / No connection to network
- Orange LED on : LAN data transfer rate 100 Mbps

I. **USB/A Port**

- To connect to the 4I/O USB expansion
  Take top USB port when using the locking USB cable, provided with 4I/O USB expansion board.
- To insert Wi-Fi stick

Figure 4.3 The TI BPL2 EDGE — front panel

NOTE

Power and output connectors are located on the back of the board. The TI BPL2 EDGE interface board powers the 4I/O USB expansion boards. An external power supply is necessary for the BPL (pin J and K on the TI BPL2 EDGE back connector). The external power supply can also be used to feed the interface (pins A and B) and to feed the sensors via the interface (IN pins D and E, OUT pins P and R). The more TrafiSense2 devices are used, the more powerful the PSU has to be.

Table 4.1 Pinout of the back connector of TI BPL2 EDGE

TOP		BOTTOM	
1	Input 1	A	DC Ground PS to TI BPL2 EDGE **NOTE** Mind the polarity !
2	Input 2	B	12–60 V DC for interface **NOTE** Mind the polarity !
3	Input 3	C	Not connected
4	Not connected	D	1st pole of DC supply 24–48 V DC for sensors, polarity insensitive
5	Not connected	E	2nd pole of DC supply 24–48 V DC for sensors, polarity insensitive
6	Not connected	F	Output 1 (+)
7	Ref output 1 (-)	H	Ref output 1 (-)
8	Not connected	J	Error output (+)
9	Not connected	K	Error output (-)
10	Input 4	L	Earth
11	Not connected	M	Not connected
12	Not connected	N	Not connected
13	Not connected	P	1st pole of BPL sensor interface
14	Not connected	R	2nd pole of BPL sensor interface
15	Not connected	S	Output 3 (+)
16	Ref output 3 (-)	T	Ref output 3 (-)
17	Not connected	U	RS-485A
18	Not connected	V	RS-485B
19	Not connected	W	Output 2 (+)
20	Ref output 2 (-)	X	Ref output 2 (-)
21	Not connected	Y	Output 4 (+)
22	Ref output 4 (-)	Z	Ref output 4 (-)

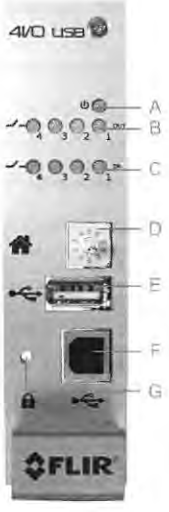
NOTE

The cover that is used for mechanical protection of the components on the solder side has a tight tolerance to the immediate right-neighbor card in the rack. Take care when plugging the TI BPL2 EDGE card in and out of the rack.

Table 4.2 Maximum dimensions of TI BPL2 EDGE

	TI BPL2 EDGE
Height	115 mm / 4.53 in
Depth	191 mm / 7.52 in
Width	59 mm / 2.32 in
Weight	270 g / 0.60 lb

4.6 4I/O USB expansion board (BPL only)



A. Power LED
   - Off : no power
   - Green : power OK
   - Red : no communication

B. LEDs for detection output 5–8 (*or* 9 to 12 *or* 13 to 16 etc.)

C. LEDs for the inputs 5 to 8 (*or* 9 to 12 *or* 13 to 16 etc.)

D. Channel selector switch to set the inputs/outputs of the board
   - Switch 1 : input/output 5...8
   - Switch 2 : input/output 7...10
   - Switch 3 : input/output 9,..12
   - Switch 4 : input/output 11...14
   - Switch 5 : input/output 13...16
   - Switch 6 : input/output 15...18
   - Switch 7 : input/output 17...20
   - Switch 8 : input/output 19...22
   - Switch 9 : input/output 21...24

E. USB/A connector to 4I/O USB

F. USB/B connector from TI BPL2 EDGE (5V Power Supply for 4I/O USB)

G. M3 threaded hole to be used with provided locking USB cable to prevent accidental removal of the cable

NOTE

Power, input and output connectors are located on the back of the board. The 4I/O USB expansion boards are powered by the TI BPL2 EDGE board via the USB/B connector on the front panel.

Table 4.3 Pinout of the back connector of 4I/O USB

TOP		BOTTOM	
1	Input 1	A	DC Ground PS to TI BPL2 EDGE **NOTE** Mind the polarity !
2	Input 2	B	12–60 V DC for interface **NOTE** Mind the polarity !
3	Input 3	C	Not connected
4	Not connected	D	1st pole of DC supply 24–48 V DC for sensors, polarity insensitive
5	Not connected	E	2nd pole of DC supply 24–48 V DC for sensors, polarity insensitive
6	Not connected	F	Output 1 (+)
7	Ref output 1 (-)	H	Ref output 1 (-)
8	Not connected	J	Error output (+)
9	Not connected	K	Error output (-)
10	Input 4	L	Earth
11	Not connected	M	Not connected
12	Not connected	N	Not connected
13	Not connected	P	1st pole of BPL sensor interface
14	Not connected	R	2nd pole of BPL sensor interface
15	Not connected	S	Output 3 (+)
16	Ref output 3 (-)	T	Ref output 3 (-)
17	Not connected	U	RS-485A
18	Not connected	V	RS-485B
19	Not connected	W	Output 2 (+)
20	Ref output 2 (-)	X	Ref output 2 (-)
21	Not connected	Y	Output 4 (+)
22	Ref output 4 (-)	Z	Ref output 4 (-)

Table 4.4 Maximum dimensions of 4I/O USB

	4I/O USB
Height	115 mm / 4.53 in
Depth	191 mm / 7.52 in
Width	29 mm / 1.14 in
Weight	100 g / 0.22 lb

5 Installation guidelines

5.1 Selecting the right lens

The following types of TrafiSense2 devices are available:

- **690 for detection at short range (0-25 m / 0-80 ft):**
  - For stop bar presence detection, e.g. green on demand, with TrafiSense2 installed at the stop bar.
  - For traffic adaptive detection (count and/or zone occupancy measurement, e.g. for SCATS, SCOOT, ITACA, UTOPIA, ADIMOT), at short distance, with TrafiSense2 in loop mode and looking downwards to clearly see the gaps between consecutive vehicles.
  - For traffic data collection.
  - For detection of wrong way drivers.
- **645 for detection at medium range (10-75 m / 33-245 ft):**
  - For stop bar presence detection, e.g. green on demand, with TrafiSense2 installed on the opposite side of small to medium-sized intersections.
  - For presence detection at a certain distance from the stop bar, i.e. lengthening green time, with TrafiSense2 installed at the stop bar.
  - For detection of wrong way drivers.
- **632 for detection at ultra-long range (20-120 m / 65-400 ft):**
  - For stop bar presence detection, e.g. green on demand, with TrafiSense2 installed on the opposite side of larger intersections.
  - For presence detection at a certain distance from the stop bar, i.e. lengthening green time, with TrafiSense2 installed at the stop bar.

Table 5.1 TrafiSense2 lens specifications VGA 640 x 480 resolution

Type	Focal distance	Angle of view		Detection distance
		Horizontal	Vertical	
690 (10-7470)	7,5 mm	90°	69°	short range 0-25 m (0-80 ft)
645 (10-7474)	13 mm	45°	37°	medium range 10-75 m (33-245 ft)
632 (10-7476)	19 mm	32°	26°	ultra-long range 20-120 m (65-400 ft)

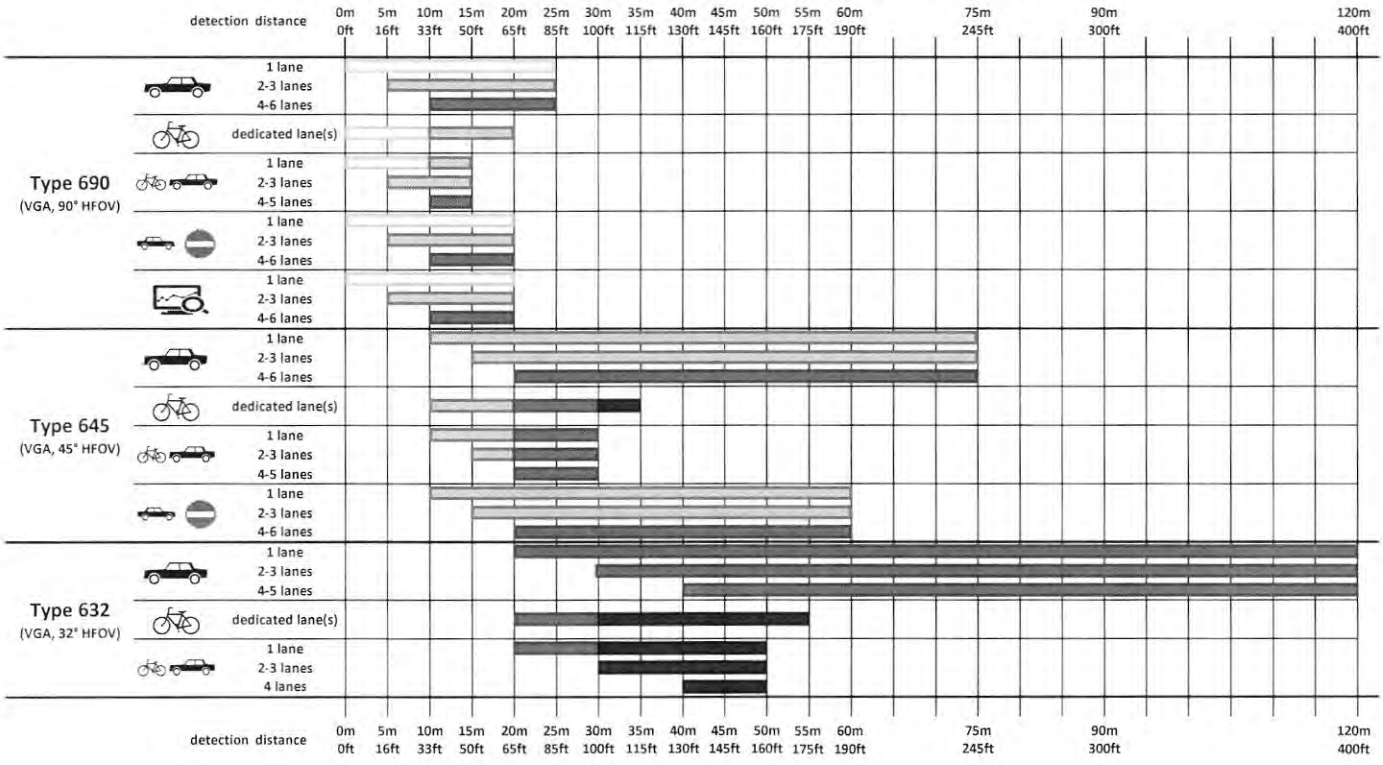
5.2 Detection range chart for vehicle, bicycle and inverse presence detection and traffic data collection with the various TrafiSense2 types

NOTE

The detection ranges in the following chart are indicative. Make sure to always check which lens type best suits your specific location and required application.

ThermiCam/TrafiSense2 V2X:

Indicative Detection Range Chart for Vehicle and Bicycle Presence Detection, Wrong Way Driver Detection and Traffic Data Collection



Remark: Be aware of optical occlusion, on the same lane and on adjacent lanes !

Remark: Be aware of camera vibration/shaking, especially when narrow lens is used !

5.3 Defining installation height, position and orientation for minimal occlusion

The height and position of the sensor are important factors for minimizing occlusion. Occlusion occurs when a vehicle blocks part of the sensor's field of view. Please contact FLIR Intelligent Transportation Systems for more information on how to minimise or avoid occlusion.

Keep the following in mind when installing the TrafiSense2 :

- Installation height
  - For presence detection and detection of wrong way drivers
    The installation height depends on the number of lanes to monitor and the position of the TrafiSense2 towards the road - see table below.
  - For traffic data collection
    Mount the sensor as high as possible. The minimum installation height is 6 m / 20 ft.
- Position towards the road
  - Put the sensor in overhead position if possible (pan angle = 0°).
  - If not, choose a side-fired position next to the fastest lane (pan angle = max. 25°).
    For detection of wrong way drivers on multiple lanes, make sure to mount TrafiSense2 high enough to avoid occlusion.
- Device orientation
  - Position the sensor so that 60-80% of the image is road and 40-20% is other (vegetation, buildings and a max of 10% sky).
  - For presence detection
    Make sure you can define the presence detection zones in the central part of the sensor image.
  - For bike detection
    Detection area should be at the bottom part of the image. (max. tilt angle 45°, ideally 30°, max. pan angle 25°, ideally 0°, roll angle should be 0°).
  - For traffic data collection
    Turn the device towards upcoming traffic.
  - For detection of wrong way drivers
    Turn the device towards upcoming or receding traffic.

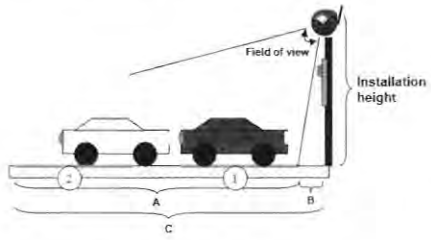
Depending on the number of lanes to monitor and the position of TrafiSense2, we recommend the following installation height:

Table 5.2 Installation height in function of the number of lanes to monitor and the position of TrafiSense2

Lanes to monitor	Side-fired	Overhead	Installation height (to avoid occlusion)
1	x		≥ 3,5 m / 11,5 ft
1		x	≥ 5 m / 16,4 ft
2	x		≥ 8 m / 26,2 ft
2		x	≥ 5 m / 16,4 ft
3	x		≥ 12 m / 39,4 ft
3		x	≥ 7 m / 23,0 ft
4	x		≥ 12 m / 39,4 ft (To minimise occlusion)
4		x	≥ 8 m / 26,2 ft

5.4 Relation between detection area, lens type, installation height, and position

The detection area and the minimum and maximum detection distance are related to the installation height and the lens type of the device and its position towards the road. Position the presence detection zones within the detection area.



A. Detection area
B. Minimum detection distance
C. Maximum detection distance

1. Presence detection zone 1
2. Presence detection zone 2

Figure 5.1 Detection area

5.5 Installation topology (only for BPL installation)

Connect the sensors to the interface in a star or bus topology or a combination of both.

- Star topology
  Each TrafiSense2 is connected directly to the interface.
- Bus topology (also known as daisy chain)
  All TrafiSense2 devices are connected in sequence. One sensor is connected to the interface.
- Combined star-bus topology
  See below

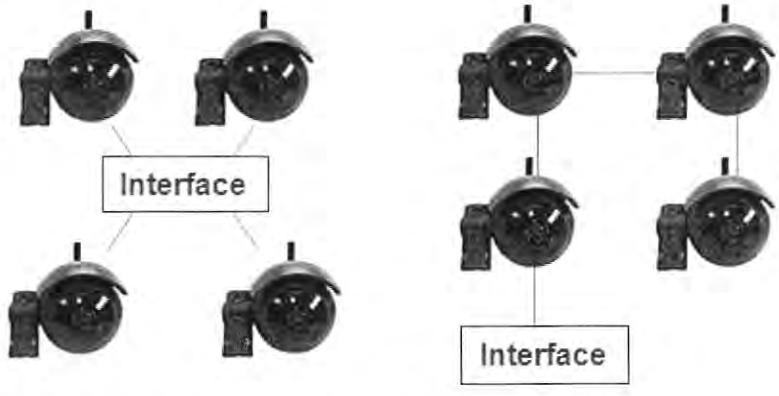


Figure 5.2 Star topology (left) and bus topology/daisy chain (right)

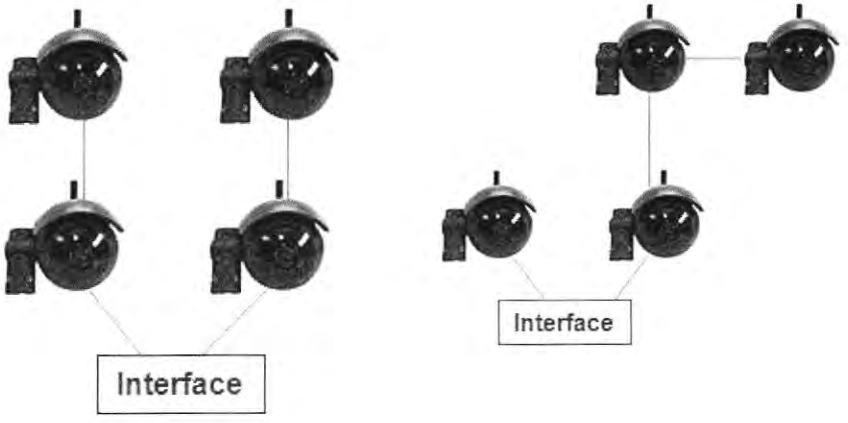


Figure 5.3 Combined star and bus topology

6 Installation procedure

6.1 Overview of the installation procedure

Installing a standard TrafiSense2 system consists of the following tasks:

- For BPL installation:
  1. *Mounting the TrafiSense2 devices on a stable pole*
  2. *Connecting the connector to the cable*
  3. *Mounting the connector with cable on the device*
  4. *Connecting TrafiSense2 to TI BPL2 EDGE and the controller*
  5. *Optional: Installing 1 to 4 4I/O USB expansion boards*
  6. *Fixing the antenna and optimizing the position of the TrafiSense2 devices*
- For PoE installation
  1. *Mounting the TrafiSense2 devices on a stable pole*
  2. *Connecting the connector to the cable*
  3. *Mounting the connector with cable on the device*
  4. *Fixing the antenna and optimizing the position of the TrafiSense2 devices*

6.2 Installation tools required but not included with TrafiSense2

Tool	Purpose
Retaining straps or bolts and washers M8	To mount TrafiSense2 on the pole
N°13 wrench Hex key n° 4	To tighten the M8 bolts
PSU, min. 12 - max. 42V AC 50/60 Hz, min. 12 - max. 60 V DC	For BPL installation, to power TI BPL2 EDGE and all connected devices
Standard 3 wire installation cable no multi-cables (crosstalk) Ø = [5 - 10] mm Maximum cable length: 300 m / 1000 ft Required number of wires: 3 (+, -, FE)	To connect TrafiSense2 to TI BPL2 EDGE
Network cable (Cat 5e)	To connect TI BPL2 EDGE to the network
Cable, UTP Cat 5e or better Ø = [4 -9] mm Maximum cable length: 100 m / 300 ft Required number of wires: 8 (4 ETH, 3+1 OUTPUTS)	For PoE installation, to connect TrafiSense2 to the network
Approved fuses: Fuse 1.6A : FUS1A6–FF • Littelfuse 2301160xxx • Schurter 0034.0903 • Ferraz Shawmut N093323P • SIBA 7000140.1,6	For TrafiSense2 used without interface
Cutter, stripper pliers	To dismantle the installation and Cat 5e cable and strip the cable wires
Wire ferrules	To make sure there is no bad connection due to separating wires in the installation and Cat 5e cables
Screwdriver	To fix the cable wires to the connectors

NOTE

- Power consuming loads other than the sensors are not allowed on the supply connection of the sensor ports.
- If power-line communication is used:
  - Interconnection from interface to sensors must be carried out using separate installation cable(s), not used for any other purpose. Multi cables are not allowed.
  - Separate (single) wires are not allowed for interconnection, only cables are acceptable.
  - Keep cable wires for any BPL connection as short and tight together as possible.
  - Minimize number of cable transitions.
- Take energy loss due to long cables into account for power supply calculation

6.3 Power specifications

Power (Maximum)	Average power (Heat calculation)	10.5W
	Peak power (Supply calculation)	15W
Voltage (Limits)	Absolute minimum voltage	24VDC/24VAC
	Absolute maximum voltage	60VDC/42VAC
Current (Average)	Terminal voltage 24VDC	371mA
	Terminal voltage 48VDC	175mA
	Terminal voltage 60VDC	143mA
	Terminal voltage 24VAC	433mA
	Terminal voltage 42VAC	235mA

6.4 Typical use case power cable

6.4.1 BPL

The following table gives you an overview of the minimum cable size based on PSU, number of sensors and cable length in a star and bus topology.

NOTE

- The cable length may be increased (but is always limited to 300m) provided that the cross section of the cable is also increased pro rata.
- Higher cable cross sections may not fit directly into the connector of the device. In that case, use as short as possible adaption pieces.
- Conductors are assumed to be copper below 60°C or 140°F.

Power supply (AC or DC)

- Interface + 1 sensor: 50W
- Interface + 2 sensors: 80W
- Interface + 3 sensors: 120W
- Interface + 4 sensors: 130W
- Interface + 5 sensors: 170W
- Interface + 6 sensors: 200W
- Interface + 7 sensors: 230W
- Interface + 8 sensors: 250W

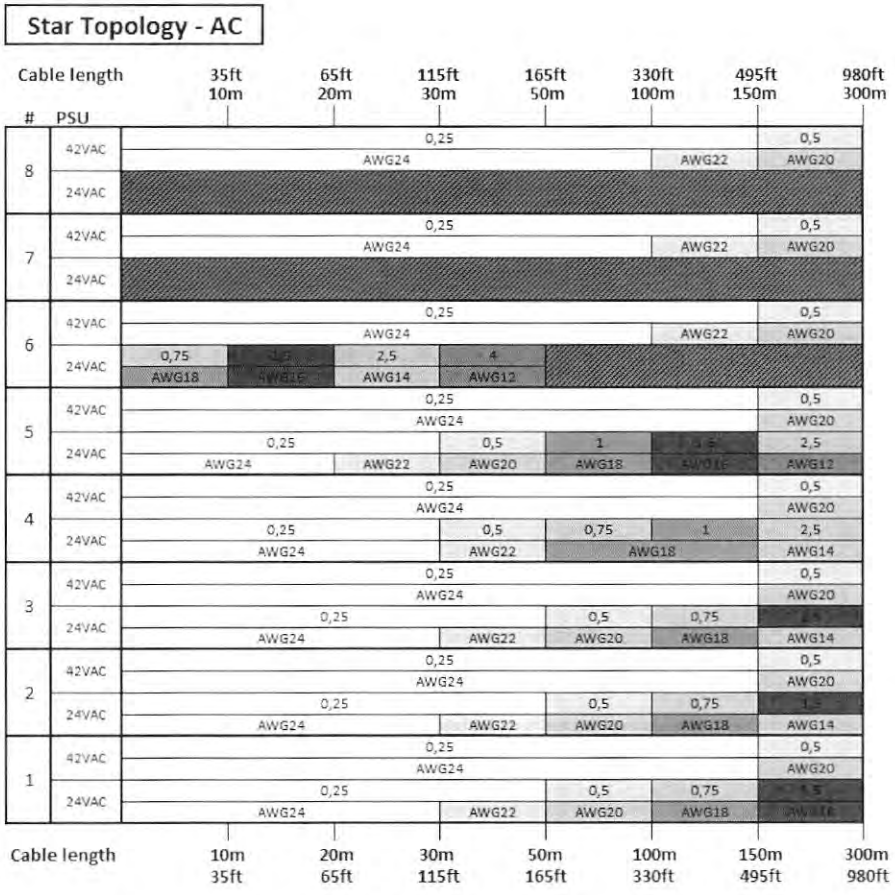


Figure 6.1 Minimum cable size based on AC PSU and cable length in a star topology in mm²and AWG

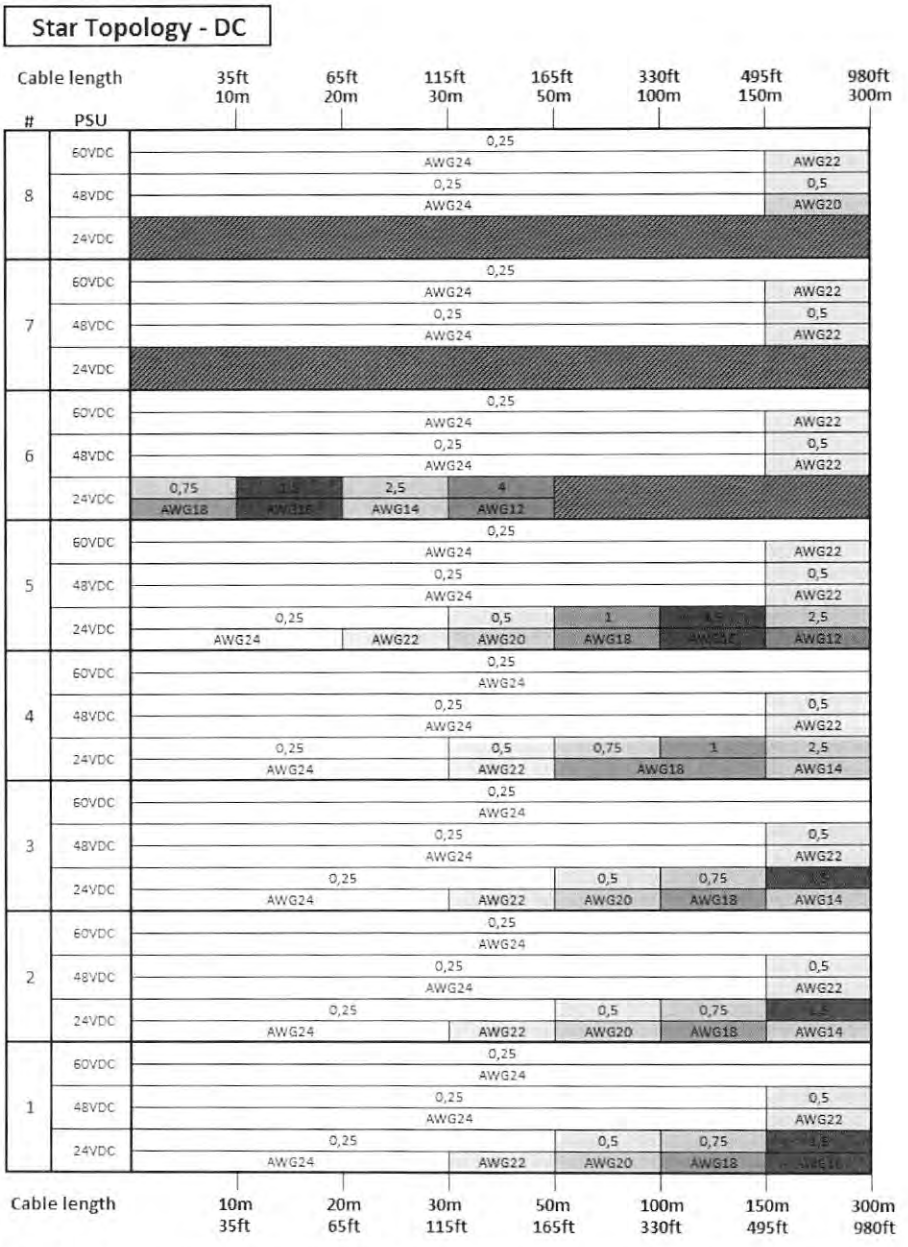


Figure 6.2 Minimum cable size based on DC PSU and cable length in a star topology in mm²and AWG

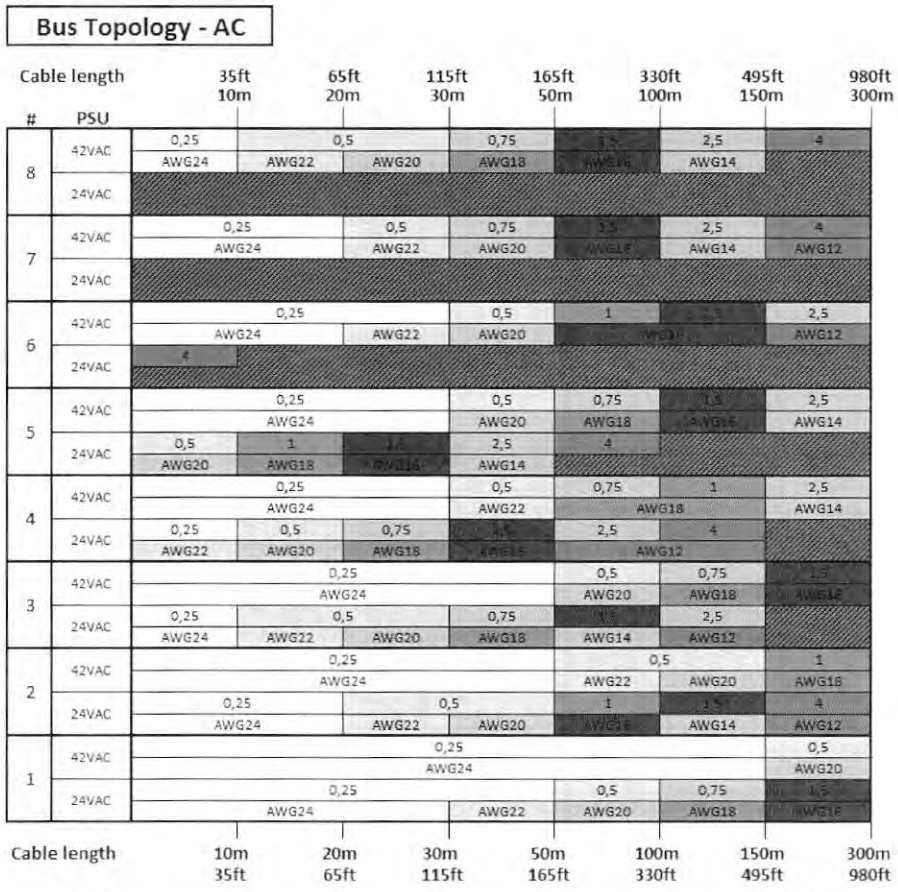


Figure 6.3 Minimum cable size based on AC PSU and cable length in a bus topology in mm²and AWG

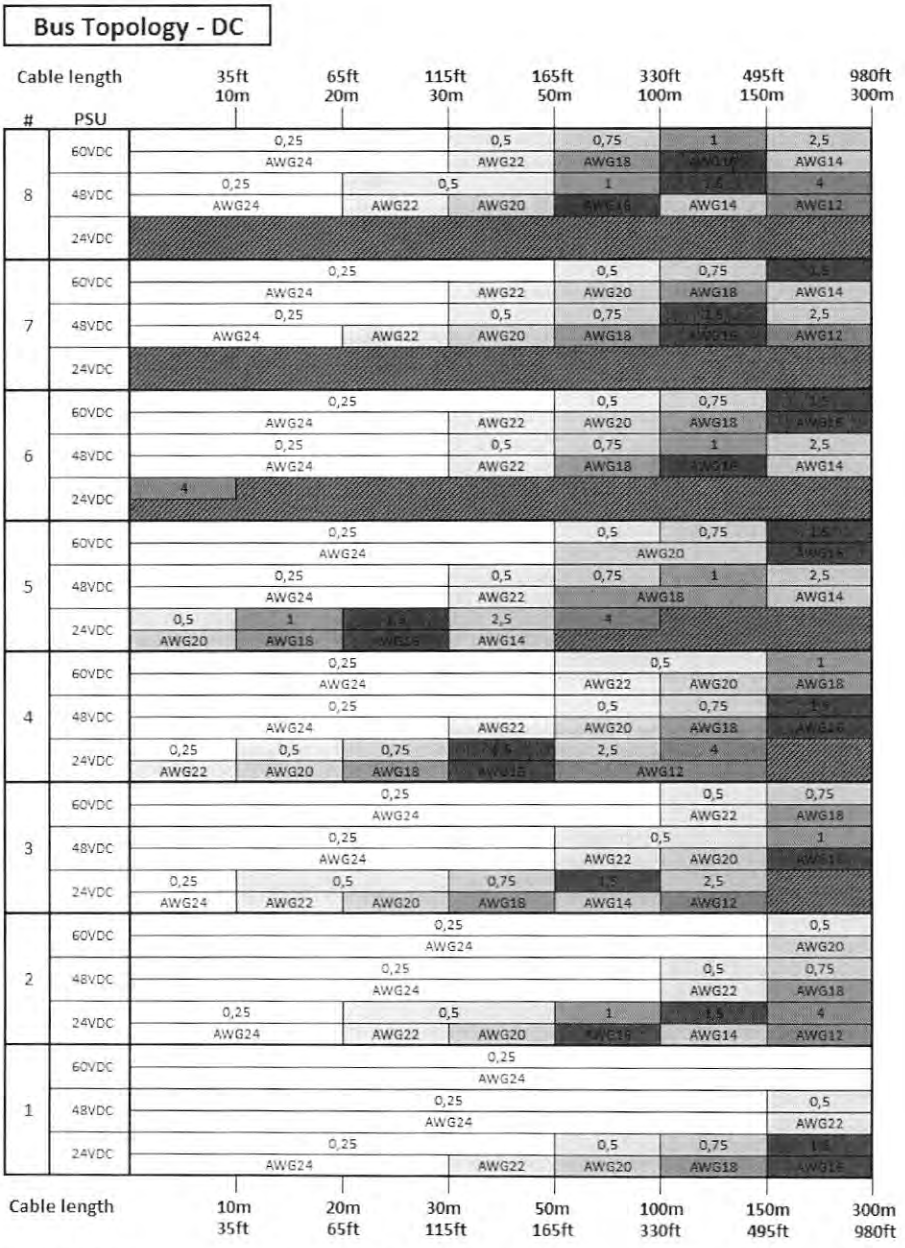


Figure 6.4 Minimum cable size based on DC PSU and cable length in a bus topology in mm²and AWG

6.5 BPL installation

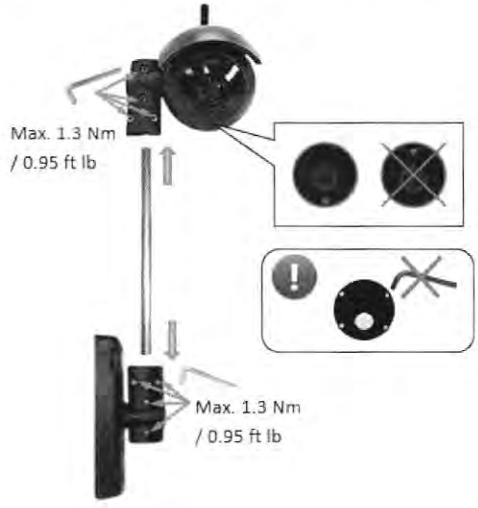
6.5.1 Mounting the TrafiSense2 devices on a stable pole

Installation height: 3.5-15m or 11.5-50ft

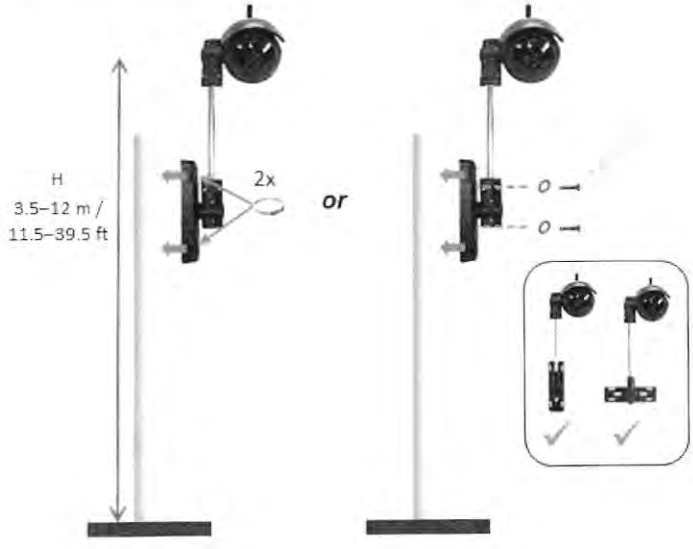
> **NOTE**
>
> For more installation guidelines, see 5.3 *Defining installation height, position and orientation for minimal occlusion*, page 17.

1. Fix the tube to the brackets (Torque max = 1.3 Nm / 0.95 ft lb).
   TrafiSense2 is a downwards looking device with the detection LED at the bottom side of the sensor.

⚠ WARNING
Do not open TrafiSense2 as this voids the warranty.



2. Fix TrafiSense2 to the pole using retaining straps or bolts and washers M8.
   Put the retaining straps through the parallel slots on the side of the bracket.
   Alternatively, put the bolts through the central holes of the bracket and tighten them using a N°13 wrench.



3. Position TrafiSense2 provisionally and fix the mounting brackets (Torque max = 1.3 Nm / 0.95 ft lb).
   You can mount TrafiSense2 on a horizontal or vertical pole or on a mast arm.

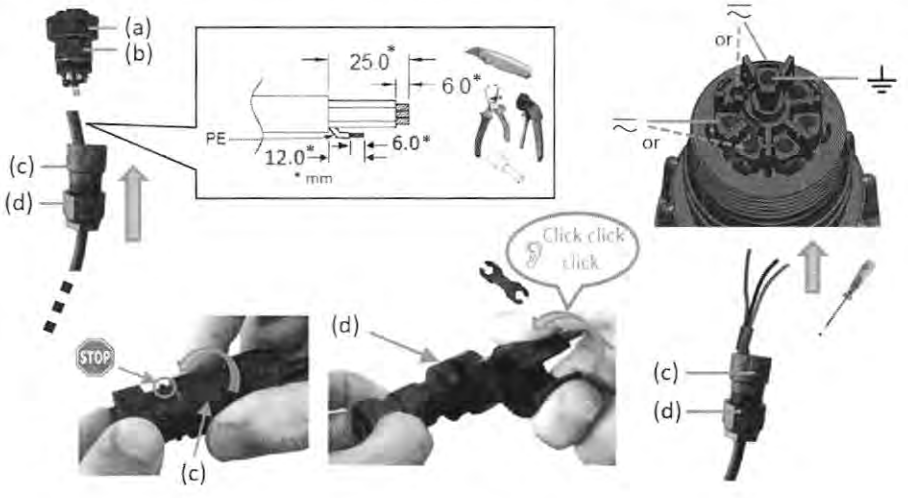
6.5.2 Connecting the connector to the cable

NOTE
Check if the correct sealing is installed within the cable holder (c). If your cable is > 7 mm, insert the internal seal included in the package.

1. Put the installation cable (3 wires) through the cable gland (d) and holder (c).
2. Dismantle the cable (+/- 25 mm or 0,8 in) and strip the cable wires (+/- 6 mm or 0,24 in).
   If you are using a flexible stranded wire, use wire ferrules to make sure there is no bad connection due to loose hanging wires.
3. Connect the cable to the 8-pole connector (b).

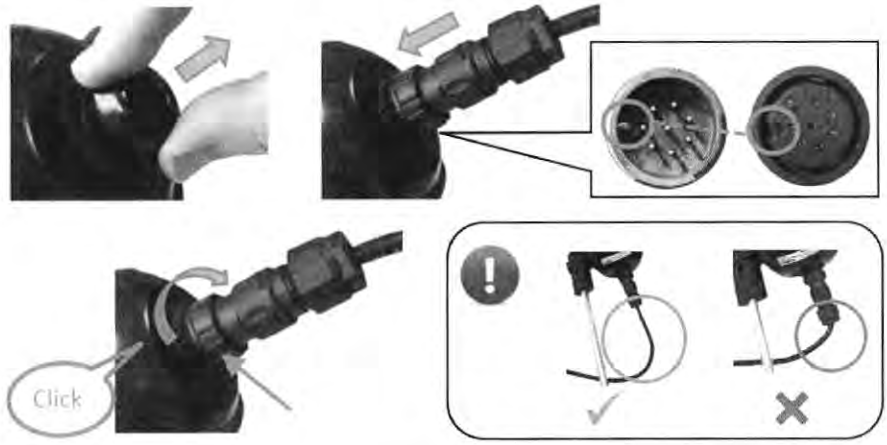
NOTE
Pins 1–2 and 3–4 are connected with bridges, so you can connect the BPL A wire in pin 1 or 2 and the BPL B wire in pin 3 or 4.

4. Tighten the cable holder (c) hand tight until you reach the blocking ridge.
5. Use the supplied wrench tool to tighten the cable gland (d) until you hear several clicks.



6.5.3 Mounting the connector with cable on the device

1. Remove the plastic protective cap from the device and mount the connector with cable on the device.
   Mind the slot for correct mounting.
2. Tighten the connector until it clicks.



WARNING

- Do not use any tools !
- Take minimum cable bending radius into account to avoid damage to the connector and sealing.

6.5.4 Connecting TrafiSense2 to TI BPL2 EDGE and the controller

1. Mount TI BPL2 EDGE into the US controller rack.

NOTE

The cover that is used for mechanical protection of the components on the solder side has a tight tolerance to the immediate right-neighbor card in the rack. Take care when plugging the TI BPL2 EDGE card in and out of the rack.

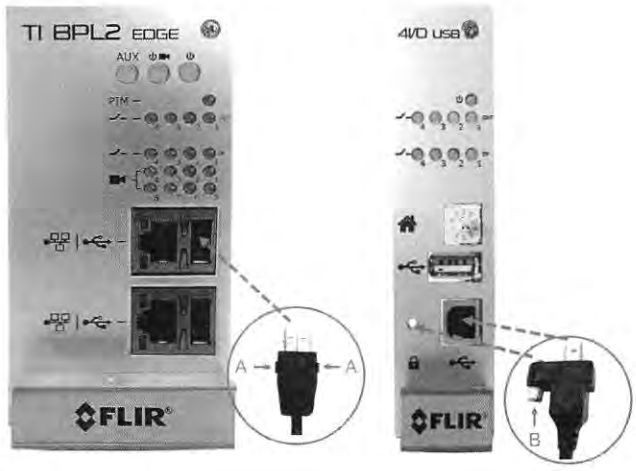
2. On the backside of the rack, do the following:
   - Connect the sensor(s) to TI BPL2 EDGE (pin P and R).
   - Connect the PSU of the sensor(s) to TI BPL2 EDGE (pin D and E)
   - Connect the PSU of the interface to TI BPL2 EDGE (pin A and B)
   - Connect the outputs:
     - For TS1 : Connect output 1 (pin F-H), 2 (pin W-X), 3 (pin S-T) and 4 (pin Y-Z) to the traffic light controller
     - For TS2 : Connect RS485 (pin U and pin V) to PIM and SDLC from PIM to the controller
3. Connect TI BPL2 EDGE to the network using the LAN connector on the front panel.
4. Connect the power supply.

6.5.5 Optional: Installing 1 to 4 4I/O USB expansion boards

1. Set the channel selector switch to assign the outputs :
   - Switch 1 : output 5...8
   - Switch 3 : output 9...12
   - Switch 5 : output 13...16
   - Switch 7 : output 17...20
2. Insert the boards in the rack in the right position of the double slot.
3. Connect the boards using the special USB A/B locking cable provided with the 4I/O USB expansion board(s) as illustrated below:

a. Connect the USB/A end of the cable to the USB/A port of TI BPL2 EDGE. Press the side clips (A) to lock the cable in the port.

b. Connect the USB/B end of the cable to the USB/B port of 4I/O USB. Tighten screw B to lock the cable in the port.



NOTE
The 4I/O USB expansion boards are also powered via this cable

6.5.6 Fixing the antenna and optimizing the position of the TrafiSense2 devices

1. Fix the antenna to the back of TrafiSense2 and tighten the antenna as much as possible by hand.
   Use the antenna as lever. Do not use external tools to avoid damage to the antenna.

   Make sure the antenna is perpendicular to the ground.
2. Connect the power supply and the PC to the network.
3. Verify the position of TrafiSense2 by viewing its sensor image using the web interface. The device should be installed with a tilt angle between 0° and 90°

   See 10 *TrafiSense2 web interface*, page 41.
4. Tighten all screws.

6.6 PoE installation

6.6.1 Mounting the TrafiSense2 devices on a stable pole

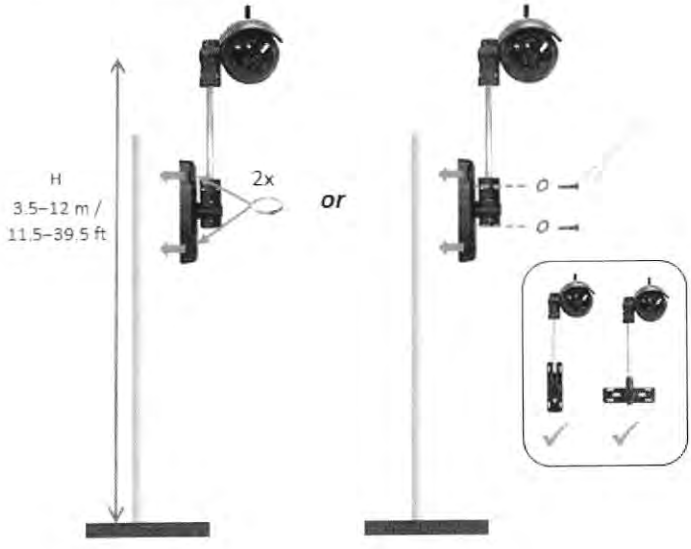
Installation height: 3.5-15m or 11.5-50ft

NOTE
For more installation guidelines, see 5.3 *Defining installation height, position and orientation for minimal occlusion*, page 17.

1. Fix the tube to the brackets (Torque max = 1.3 Nm / 0.95 ft lb).
   TrafiSense2 is a downwards looking device with the detection LED at the bottom side of the sensor.

⚠ WARNING
Do not open TrafiSense2 as this voids the warranty.

2. Fix TrafiSense2 to the pole using retaining straps or bolts and washers M8.
   Put the retaining straps through the parallel slots on the side of the bracket.
   Alternatively, put the bolts through the central holes of the bracket and tighten them using a N°13 wrench.



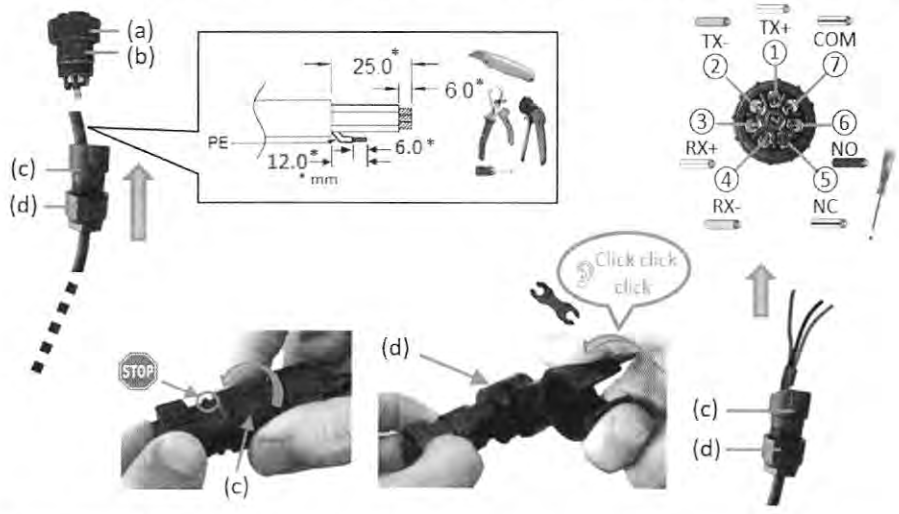
3. Position TrafiSense2 provisionally and fix the mounting brackets (Torque max = 1.3 Nm / 0.95 ft lb).
   You can mount TrafiSense2 on a horizontal or vertical pole or on a mast arm.

6.6.2 *Connecting the connector to the cable*

NOTE
Check if the correct sealing is installed within the cable holder (c). If your cable is > 7 mm, insert the internal seal included in the package.

1. Put the CAT 5e UTP cable through the cable gland (d) and holder (c).
2. Dismantle the cable (+/- 25 mm or 0,8 in) and strip the cable wires (+/- 6 mm or 0,24 in).
   If you are using a flexible stranded wire, use wire ferrules to make sure there is no bad connection due to loose hanging wires.
3. Use a screwdriver to remove the bridges between connector pins 1–2 and 3–4.

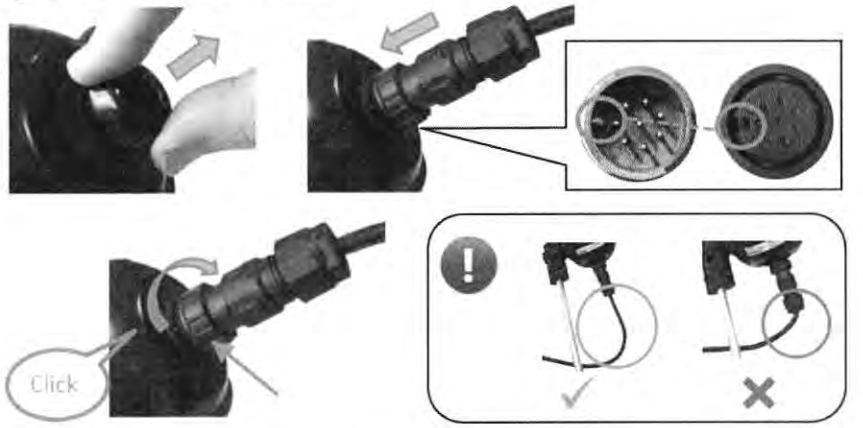
4. Connect the CAT 5e UTP cable to the 8-pole connector (b).
5. Tighten the cable holder (c) hand tight until you reach the blocking ridge.
6. Use the supplied wrench tool to tighten the cable gland (d) until you hear several clicks.



6.6.3 *Mounting the connector with cable on the device*

1. Mount the connector with cable on the device.
   Mind the slot for correct mounting.

2. Tighten the connector until it clicks.



⚠ WARNING
• Do not use any tools ! • Take minimum cable bending radius into account to avoid damage to the connector and sealing.

6.6.4 Fixing the antenna and optimizing the position of the TrafiSense2 devices

1. Fix the antenna to the back of TrafiSense2 and tighten the antenna as much as possible by hand.
   Use the antenna as lever. Do not use external tools to avoid damage to the antenna.

   Make sure the antenna is perpendicular to the ground.
2. Connect the power supply and the PC to the network.
3. Verify the position of TrafiSense2 by viewing its sensor image using the web interface. The device should be installed with a tilt angle between 0° and 90°

   See 10 *TrafiSense2 web interface*, page 41.
4. Tighten all screws.

7 Connecting to TI BPL2 EDGE and TrafiSense2

All devices connected to TI BPL2 EDGE have the same IP address as the interface but with a different port number.

When you do not know the IP address of TI BPL2 EDGE or TrafiSense2, you can still connect to TrafiSense2 via the Scan Network Tool on the interface.

7.1 Connecting to TI BPL2 EDGE and TrafiSense2 using the scan network tool

Before you can configure the system and view streaming video, you have to connect to the TrafiSense2 system. To connect to TrafiSense2, your PC, TI BPL2 EDGE and TrafiSense2 need to be in the same network range.

NOTE
Make sure your PC has a fixed IP address assigned and is not on DHCP.

1. Change the IP address of your PC to 10.0.0.x (where x is not 0,1 or 255) and subnet mask 255.0.0.0.
2. Download and install the Scan Network Tool from ITS public zone on Box.
3. Start Scan Network Tool.
4. Click *Scan Network*.
   Scan Network Tool will scan the network and will give you an overview of all devices on the network, their name, IP address and port information.

   Devices with an IP address that is not in the network range are listed as unknown devices.

5. Do one of the following:
   - To connect to the devices of which the name, IP address and port information are displayed, open the web interface of TI BPL2 EDGE or TrafiSense2 by clicking the device.

     Alternatively, you can copy the URL of the device by clicking and paste it in a web browser.
   - To connect to an unknown device, do one of the following:
     - Change the IP address of your PC so that it is in the same network range as the unknown device.
       When clicking *Scan Network*, the previously unknown device will now be displayed with its name, IP address and port number and you will be able to open the web interface by clicking the device.
     - Reassign the IP address of the unknown device as follows :

       a. In the Scan Network Tool, next to the unknown device, click (*Edit IP settings*)

       b. Change the IP address of the device so that it is in the same network range as your PC.
       c. Click *Apply*.
       d. Click *Scan Network*.
       The device is now displayed with its name, IP address and port number and you will be able to open the web interface by clicking the device.

8 About the web interface

8.1 Supported web browsers

The web interface allows a unified experience across platforms and device sizes. The interface adapts itself to the device you are viewing it on, i.e smartphone, tablet or desktop/ PC. Input can be done via keyboard/mouse or touch.

The web interface can be used on the following browsers:

		Chrome	Firefox	Safari	Internet Explorer > = 11
Desktop/ Laptop	Windows	✓	✓		✓
	Linux	✓	✓		
	Mac	✓	✓	✓	
Tablet	IPad	✓		✓	
	Android	✓			
Smartphone	IPhone	✓		✓	
	Android	✓			

8.2 Layout

The web interface can be viewed in portrait or landscape. The video and camera image are always as large as possible.

- Landscape view: Buttons and settings are located left of the image.
- Portrait view: Buttons and settings are located below the image.

9 TI BPL2 EDGE web interface

> **NOTE**
>
> When connecting to a TrafiSense2 device that is managed by a TI BPL2 EDGE, you will automatically be directed to the TI BPL2 EDGE web interface instead of the TrafiSense2 web interface.

9.1 Navigation pane

The navigation pane in the TI BPL2 EDGE web interface allows you to navigate to the following pages:

- **Live View:** displays live video from all connected devices.
- **Configuration**
  - **Outputs:** allows you to test the outputs of the interface.
  - **Error Outputs:** allows you to assign the error outputs.
  - **Network:** allows you to modify the network settings, i.e. IP and BPL settings and test the connection with the internet.
  - **Communication**: allows you to enable the PIM board and adapt its IP address
- **Administration**
  - **General:** allows you to define the general and time settings, reload a configuration, reset the configuration to the factory default and reboot the device.
  - **Firmware**: allows you to load the firmware.
  - **Users**: allows you to add, edit and remove users.
  - **Technical Event Log:** allows you view, filter and export the log file of the technical events.
  - **System Log:** allows you to download the system log.
  - **Product Security**: allows you to manage services, user authentication, physical access and certificates and view and export the physical access and user log.

9.2 Live View

The Live View page displays a static camera image of all connected TrafiSense2 devices.

Do one of the following:

- To view streaming video of a TrafiSense2 within the web interface, click ▶ at the bottom of the corresponding static camera image.
  See 30.3 *Viewing streaming video via de web interface*, page 89.
- To open the TrafiSense2 web interface, do one of the following:
  - Click the static camera image of the corresponding device.
    The TrafiSense2 web interface opens in a separate tab.
  - Click ⠿ in the top left corner of the navigation pane and click the corresponding device in the devices pane.

The TrafiSense2 web interface opens in a separate tab. To return to the TI BPL2 EDGE web interface, go to the interface tab and click the TI BPL2 EDGE in the devices pane.

9.3 Outputs

The Outputs page shows you the actual status of the outputs and allows you to test the outputs of the interface.

1. Go to *Configuration* > *Outputs*.
   The actual status of the outputs is displayed: unassigned outputs are grey, assigned outputs are blue and assigned outputs on which there is currently detection are Orange.
2. To start the test mode, click ▶.
   By default all outputs are set to "Off", regardless of their actual status.

3. Test the outputs and check whether the corresponding output LEDs on the interface are activated:
   a. Click a test output to activate it. The test output turns orange and the output LED should be on.
   b. Click an active test output to deactivate it. The test output turns blue and the output LED should be off.
4. To stop the test mode, click ■.
   The actual status of the outputs is displayed again.

9.4 Error outputs

In case of communication errors between the TrafiSense2 device and the interface, the TI BPL2 EDGE activates an error output.

TI BPL2 EDGE has 4 error outputs, i.e. one for each device connected to the interface. They can be configured as follows:

1. Go to *Configuration > Error Outputs*.
2. To assign the error outputs, select or clear the check boxes as required.
   As there are only 4 error outputs for max. 8 sensors, some error outputs might have to be shared.
3. To save your configuration, click ✓.

9.5 Network

For more information on the Network settings, see.12 *Network settings*, page 43.

NOTE

- When using several TI BPL2 EDGE devices, always adapt the BPL Channel to avoid interference between the interfaces !
- The network page gives you an overview of all connected devices. When you change the Network settings for the TI BPL2 EDGE, the changes will be sent to all connected devices and you will no longer be able to edit the network settings of the individual devices.

9.5.1 Adapting the port numbers of the connected devices

The Network page of the interface gives you an overview of the connected devices.

1. Go to *Configuration* > *Network* > *IP Settings*.

2. Under *Connected Devices*, click the device for which you want to adapt the port numbers.

3. Click a port and adapt as necessary.
4. To save your configuration, click .

9.6 Communication

Enable the PIM module for TS 2/ATC controllers.

1. Go to *Configuration* > *Communication*.
2. Turn *PIM Enabled* on.

3. Specify the IP *Address* of the PIM module.
4. To save your configuration, click .

9.7 Administration

9.7.1 General

For more information on the general settings and time settings, see 11 *General and time settings*, page 42.

9.7.2 Firmware

Select the sensors for which you want to upgrade the firmware.

NOTE
• When upgrading interface firmware, make sure to only select the TI BPL2 EDGE. • When upgrading sensor firmware, make sure to only select TrafiSense2 devices.

For more information on firmware upgrades, see 32.2 *Firmware upgrade of TrafiSense2*, page 95.

9.7.3 Users

For more information on adding, changing and removing users, see 13 *User Management*, page 45.

9.7.4 Technical event log

Select the devices for which you want to see the technical events.

For more information, see 32.3 *Technical Event log*, page 95.

9.7.5 System logs

For more information on downloading the system log, see 32.4 *System log*, page 96.

9.7.6 Product security

For more information on services, user authentication, physical access, certificates, physical access log and user log, see 13 *User Management*, page 45.

10 TrafiSense2 web interface

10.1 Navigation pane

The navigation pane in the web interface allows you to navigate to the following pages:

- **Live View:** displays live video from TrafiSense2.
- **Detection**
  - **Zones:** allows you to draw detection zones.
  - **Settings:** allows you to configure the detection zones.
  - **Calibration:** allows you to calibrate the TrafiSense2 device.
- **Configuration**
  - **Outputs:** allows you to assign the outputs.
  - **Video:** allows you to define the video compression settings.
  - **Camera:** allows you to define the thermal region of interest.
  - **Network:** allows you to modify the network settings.
  - **Display:** allows you to define the overlay.
- **Administration**
  - **General:** allows you to define the general and time settings, reload a configuration, reset the configuration to the factory defaults, reboot the device, import and export configurations and offline networks.
  - **Firmware**: allows you to load the firmware.
  - **Users**: allows you to add, edit and remove users.
  - **Technical Event Log:** allows you view, filter and export the log file of the technical events.
  - **System Log:** allows you to download the system log.
  - **Product Security**: allows you to manage services, user authentication, physical access and certificates and view and export the physical access and user log.

11 General and time settings

11.1 Adapting the general settings

1. Go to *Administration* > *General*.
2. Under *Settings*, do one of the following:
   - To change the *Device name*, click it.
   - To change the *Language* of the web interface, click it and select a language. The Web interface is available in German, English, Spanish, French, Italian, Portuguese, Russian and Chinese.
   - To change the *Temperature Threshold* (default 60°), click the up and down arrows or type in a new value.
   - To deactivate the detection LED on TrafiSense2, click *Detection Led*.
3. To save your configuration, click .

11.2 Adapting the time settings

NOTE
When TrafiSense2 is used with TI BPL2 EDGE, time settings must be configured on the interface.

1. Go to *Administration* > *General*.
2. Switch to the *Time* pane.
3. Do one of the following:
   - To switch to a different *Time Zone*, click and select one.
   - To synchronize the time of TrafiSense2 with the clock of the NTP server, select *NTP* and enter the *NTP server name*.
   - To stop time synchronization with the NTP server and manually enter the date and time:
     a. Clear the *NTP* check box.
     b. Click *Edit*.
     c. Enter the date (DD/MM/YYYY) and time.
     d. To save the time, click *Set Clock*.
   - To stop time synchronization with the NTP server and synchronize the date and time with that of your PC, click *Synchronize Clock*..
4. To save your configuration, click .

12 Network settings

12.1 Adapting the IP settings

1. Go to *Configuration* > *Network*.
2. Under *IP settings*, adapt any of the following:
   - *Default Gateway*
   - *Name Server*
   - *IP Address*
   - *Subnet Mask*
   - Alternatively, to automatically get an IP address from the DHCP server, turn on *DHCP*.
3. To save your configuration, click .

12.2 Adapting the Wi-Fi settings

1. Go to *Configuration* > *Network*.
2. Switch to the *Wi-Fi* pane and do any of the following:

NOTE
This pane is disabled when TrafiSense2 is used with TI BPL2 EDGE.

   - To disable the Wi-Fi, turn off *Wireless Mode*.
   - To allow Wi-Fi scanning for travel time calculation, change the Wireless Mode to *Monitor*.
   - In all other cases, set the Wireless Mode to *Access Point*.
   - To change the name of the Wi-Fi network, adapt the *Wireless Network Name (SSID)*.
   - To not display the Wi-Fi network in the list of available wireless networks, turn on *Hide SSID*.

NOTE
Even though the Wi-Fi is not displayed, you can still connect to it.

   - Adapt the *Wifi Password (WPA Shared Key)*.
   - To avoid interference between several TrafiSense2 devices, adapt the *Wireless Channel*.
     Choose a channel between 1 and 11. Make sure not all TrafiSense2 devices are on the same channel.

12.3 Adapting the BPL settings

1. Go to *Configuration* > *Network*.
2. Switch to the *BPL* pane.

NOTE
This pane is only available when TrafiSense2 is used with TI BPL2 EDGE.

   a. To avoid interference between several or devices, adapt the *Channel*.
      Choose a channel between default (i.e. 0), 1, 2 and 3.

b. Click *Apply.*
All TrafiSense2 devices connected to the same TI BPL2 EDGE will be set to the same channel.

The time on those TrafiSense2 devices is synchronized with the time of the TI BPL2 EDGE. NTP synchronization is no longer possible.

12.4 Testing the network

1. To check whether TrafiSense2 can access the internet, do one of the following:
   - Enter a *Domain Name.*
   - Enter a *Name Server*
2. Click *Apply.*

13 User Management

Define the users that are allowed to log on to TrafiSense2 and their role.

13.1 Adding a new user

1. Go to *Administration* > *Users*.
2. Under *Add new user*, specify the following :
   - Username
   - Role, i.e. Viewer or Administrator
   - Password
     Repeat the password in the *Confirm password* field.
3. Click *Add*.
   The user is added to the Overview.

13.2 Changing the user settings

1. Go to *Administration* > *Users*.
2. Under *Overview*, click *Edit* next to the user for which you want to change the settings.
3. Change the following fields as required:
   - Username
   - Role, i.e. Viewer or Administrator
   - Password
     Repeat the password in the *Confirm password* field.
4. Click *OK*.

13.3 Removing a user

1. Go to *Administration* > *Users*.
2. Under *Overview*, click *Remove* next to the user you want to remove.

14 Calibration

> **NOTE**
>
> The following functions require calibration:
>
> - Traffic data collection, see 19 *Traffic data collection*, page 59.
> - Detection of wrong way drivers, see 23 *Detection of wrong way drivers*, page 72.

14.1 Defining a calibration zone

Calibrate the device to make sure that the distances in your camera image match the real distances on the road.

1. Go to *Detection* > *Calibration*.
2. Check and adapt the *Camera Height* and *Tilt* angle.
3. Tilt the device until the *Tilt* angle is displayed in green (between 0 and 90).
   For more information, see image below.

   > **NOTE**
   >
   > If the tilt angle is not between 0 and 90, you will not be able to save the configuration.

4. Click and then to add a horizontal line In the camera image where you want to do detection.
   Make sure the horizontal line corresponds to a known distance, e.g. width of a traffic lane, distance between 2 poles, etc..

   The horizontal line is displayed in green and serves as reference for the calibration.

   > **NOTE**
   >
   > If necessary, you can remove the horizontal line by clicking .

5. With the horizontal line selected, specify the actual *Line length*.
   For more information, see image below.
6. Click *Apply Calibration*.
   Alternatively, to discard the line length and restart the calibration, click *Reset Calibration*.

14.2 Verifying the accuracy of calibration

Add horizontal and vertical lines to verify the calibration.

1. Click and do one of the following :

   - To add a horizontal line in the camera image, click
     The horizontal line is displayed in light blue.

   - To add a vertical line in the camera image, click
     The vertical line is displayed in purple.

NOTE
Make sure the horizontal line corresponds to a known distance, e.g. distance between 2 poles, and the vertical line to a known height, e.g. of a pole.

2. With the line selected, check whether the *Line length* corresponds to the actual distance or height.
   For more information, see image below.
3. If the calibration is not correct, undo the calibration by clicking *Reset Calibration* and restart all over.

Figure 14.1 Calibration page

15 Adapting the Region Of Interest (ROI) of the thermal core for more contrast

15.1 When to adapt the ROI of the thermal core

In order to detect vehicles and bicyclists in an efficient way, it is crucial that you select the correct lens type. For more information, see 5.2 *Detection range chart for vehicle, bicycle and inverse presence detection and traffic data collection with the various TrafiSense2 types*, page 15.

To have sufficient contrast in the sensor image, it is crucial that you optimize the position of your sensor so that 60-80% of the image is road and 40-20% is other (vegetation, buildings and a max of 10% sky).

If however, after following these guidelines, there is still not sufficient contrast in your sensor image, you can adapt the Region of Interest (ROI) of the thermal core.

15.2 Adapting the ROI of the thermal core

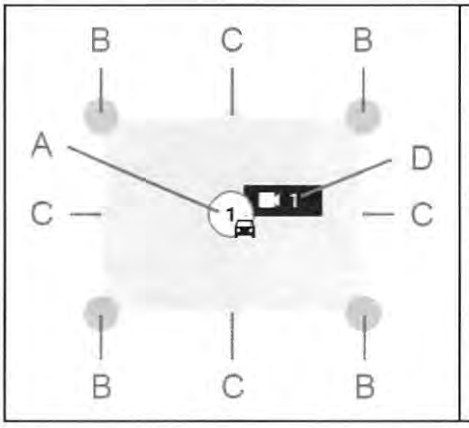
1. Go to *Configuration* > *Camera*.
2. Turn *Set thermal region of interest* on.
   The thermal region of interest is displayed in the camera image as an orange square.
3. Adjust the thermal region as required:
   - Adjust the size of the thermal region by dragging the bottom right corner.
   - Move the thermal region by clicking and dragging.
   - To set the entire screen as thermal region, click .
4. To save your configuration, click .

16 Vehicle presence detection

16.1 About vehicle presence detection zones

Vehicle presence detection works with vehicle presence detection zones.

You can define up to 24 vehicle presence detection zones. Each zone has the following characteristics, as illustrated in the image below:



- Zone ID **(A)**, which is automatically assigned.
- 4 zone points **(B)**
- Direction, defined by the direction points **(C)**
- Output **(E)**
  Multiple vehicle detection zones can be assigned to one output. See 24 *Detection outputs*, page 75.

NOTE

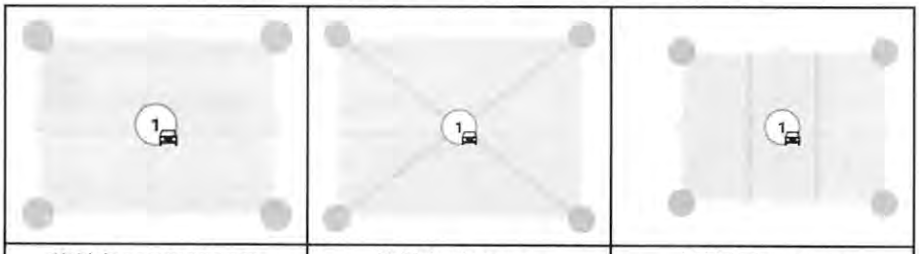
A vehicle detection zone also detect bicyclists, but does not make a distinction between bicyclists and vehicles.

16.2 Vehicle detection modes

A zone can have 3 detection modes or functions, defined by the zone type:

- Presence: presence detection of moving and stopped vehicles (= default)
- Stop: detection of stopped vehicles only
- Loop: vehicle counting
  The vehicle counting can only be performed on directional presence detection zones. The function is based on pulses that are sent to the controller. The number of pulses corresponds to the number of vehicles and the length of the pulse indicates the zone occupancy.

Depending on the zone type, the vehicle presence zone will look differently.



Vehicle presence zone	Vehicle stop zone	Vehicle loop zone

NOTE

A vehicle loop zone functions independently from a vehicle presence zone. You can place a loop zone over a presence zone.

16.3 Guidelines for defining vehicle detection zones

- SIZE and POSITION OF THE ZONE
  - The zone should have the length and width of a regular vehicle.

    NOTE

    Vehicle detection zones can also be used to detect pedestrians. In that case, the zones should have the size of a person.

  - For detection at the stop bar, place the zone so that the vehicle will stop in the middle of the zone. Take into account that vehicles may stop well in front of or over the stop bar.
- OVERLAPPING ZONES
  To optimize detection, use two overlapping zones and assign them to the same output. Overlapping zones minimize the chance that a vehicle stops in front or behind a zone.
- DIRECTION SENSITIVITY
  Make a zone direction sensitive in situations where vehicles in the opposite direction may cause unwanted detection. Always set the direction of the zone according to the normal direction of traffic.

16.4 Adding vehicle detection zones

Enable vehicle presence detection by adding vehicle detection zones.

1. Go to *Detection* > *Zones*.
2. To add a vehicle detection zone, click and then .

NOTE

When the maximum amount of vehicle detection zones is reached, the

3. Position and size the zone by dragging and dropping the zone points.
   Size a vehicle detection zone to the length and the width of a regular vehicle.
4. Set the direction of the zone by clicking one of the zone direction points.
5. To save your configuration, click .

NOTE

Once a vehicle presence detection zone has been added, it is by default ready to detect both moving and stopped vehicles.

You can also use vehicle presence detection zones to detect stopped vehicles only or to count vehicles by adapting the zone type. For more information, see below.

16.5 Sending a vehicle detection zone to the back

When you cannot select a vehicle detection zone because another zone is overlapping it, you can send the overlapping zone to the back.

1. Select the overlapping zone.

2. Under the camera image, click .
3. To save your configuration, click .

16.6 Deleting vehicle detection zones

1. Click the detection zone you want to delete.
2. Under the camera image, click .
3. To save your configuration, click .

16.7 Adapting the vehicle presence detection zone for stop detection

Present detection zones detect by default both moving and stopped vehicles. You can however adapt them so that they only detect stopped vehicles.

1. Go to *Detection* > *Zones*.
2. To adapt the zone for stop detection, under the camera image, change the vehicle detection mode from *Presence* to *Stop*.
3. To save your configuration, click .

16.8 Adapting the vehicle presence detection zone for vehicle counting

TrafiSense2 has a vehicle counting function based on pulses that are sent to the controller:

- the number of pulses corresponds to the number of vehicles
- the length of the pulse indicates the zone occupancy

FLIR Intelligent Transportation Systems advises to use the vehicle counting function only when the sensor is mounted in a rather vertical position with vehicle presence detection in the area close to the sensor.

A vehicle counting zone functions independently from a vehicle presence detection zone. You can place a vehicle counting zone over a vehicle presence detection zone.

1. Go to *Detection* > *Zones*.
2. To adapt the zone for vehicle counting, under the camera image, change the vehicle detection mode from *Presence* to *Loop*.
3. Adapt the direction of the zone as necessary.
4. To save your configuration, click .

16.9 Assigning an output to a vehicle presence detection zone

1. Click the detection zone for which you want to assign an output.
2. Under the camera image, click i/o.
3. Select an output.
   The output is added to the detection zone in the camera image.

   Outputs located on the device are indicated by .

   Outputs located on the interface are indicated by .
4. To save your configuration, click .

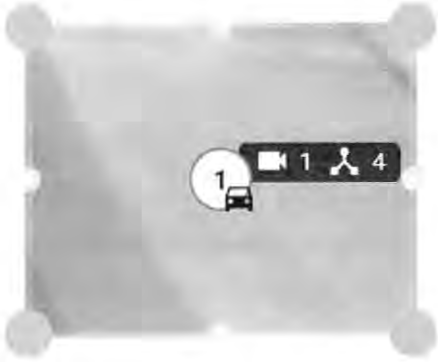


Figure 16.1 Vehicle presence detection zone with an output on TrafiSense2 and on the interface.

16.10 Setting the delay and extend time of a vehicle detection zone

The delay time is the time that elapses after the vehicle has entered the detection zone and the detection is triggered and the output changes status.

The extend time is the time that elapses after the vehicle has left the detection zone and the detection is dropped and the output changes status again.

Adapt the extend time to make sure vehicles are also detected while standing still. If another vehicle enters the detection zone before the extend time has passed, the detection is held and the extend time is reset. After the extend time, the delay time has to expire before another presence detection causes the output to change status again.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.
3. Adapt the *Delay time* and *Extend time*.
4. To save your configuration, click ✓.

16.11 Changing the presence time off

The presence time off defines the maximum delay before presence detection is deactivated. This is by default set to 4 minutes since intersection cycle lengths rarely exceed this time. When presence detection is active for longer than the presence time off, the zone will relearn, i.e. take what is in the zone as background.

You should change the presence time off when the intersection cycle length is longer or shorter than the standard 4 minutes.

1. Go to *Detection* > *Settings* > *Presence*.
2. Under *Presence*, change the *Presence time off* (default 240s).
3. To save your configuration, click ✓.

16.12 Activating detection suppression on a vehicle detection zone

Detection suppression avoids unwanted vehicle presence detection caused by wrong-way drivers, small objects, cross traffic or camera movement on the selected zone.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.

3. Do any of the following:

Type of suppression	Goal	Action
Inverse direction	To avoid detection caused by slow-driving cars, bicycles or pedestrians moving sideways through the zone or in inverse direction	Set the *Inverse direction sensitivity* to High.
	To change the maximum time during which inverse direction is suppressed	Change the *Inverse direction time on* (default: 10s, range 0–30s). **EXAMPLE:** • When set to 10, vehicles driving through the zone in inverse direction will only be detected after 10 seconds. As a result, vehicles that stop beyond the stop bar and drive backwards through the detection zone to wait at the traffic lights will only be detected after 10 seconds. • When set to 0, the direction of the detection zone will be ignored. Vehicles driving through the zone in inverse direction will be detected immediately.
Heat signatures	To avoid detection caused by thermal signatures of vehicles	Turn the *Heat signatures filter* on.
Small objects	To ignore detection of small objects	Turn *Ignore small objects* on. Set the *Ignore small objects filter strength* : • *Low*: objects smaller than 1/4 of the vehicle presence detection zone are not detected. • *Medium*: objects smaller than 1/3 of the vehicle presence detection zone are not detected. • *High*: objects smaller than 1/2 of the vehicle presence detection zone are not detected.
Cross traffic	To avoid detection caused by occlusion from fast crossing traffic on the intersection	Turn the *Cross traffic filter* on.
Camera movement	To avoid that vehicle presence detection is affected by camera movement, e.g. when TrafiSense2 is mounted on a pole that may be swinging because of the wind	Under *Camera movement suppression*, set the *Mode* to *On* and adapt the *Level* (Low, Medium, High) as necessary.

4. To save your configuration, click .

17 Conditional counting at signalized junctions

> **NOTE**
>
> This function is only available on TS2 / ATC traffic light controllers with PIM module. See 2.5 *1 to 8 TrafiSense2 devices + TI BPL2 EDGE and PIM module*, page 6.

17.1 About conditional counting

By default, vehicle presence detection zones will detect and count vehicles regardless of whether the traffic lights for that zone are red, yellow or green. With each vehicle entering a presence detection zone, detection is indicated as follows:

- the detection zone lights up
- the output linked to the detection zone is triggered
- a presence event is sent.

Advanced loop counting allows you to suppress detection based on the information from the RYG channels of the traffic light controller. As a result, you can limit the detection to:

- Count on green only
- Count on yellow only
- Count on Red only
- A combination of the above

When vehicles enter the presence detection zone, but detection is suppressed because of the advanced loop counting settings

- "**SU**" is displayed on the zone to indicate that the detection is suppressed.
- the detection zone does not light up
- the output linked to the detection zone is not triggered
- a presence event is not sent.

> **NOTE**
>
> You can use conditional counting especially for filtering (unwanted) counts, e.g. in case of optical occlusion by cross traffic.

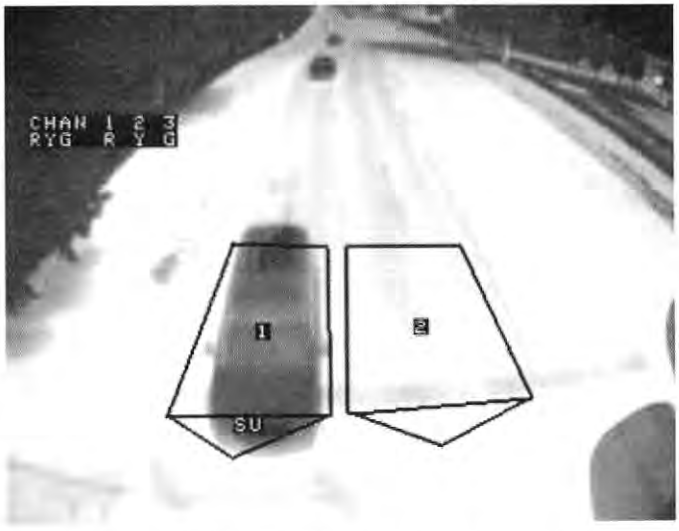


Figure 17.1 "SU" on Zone 1 indicates that vehicle detection was surpressed because of the advanced loop counting settings. The detection zone does not light up as it normally does during detection.

17.2 Enabling advanced loop counting

Advanced loop counting is disabled by default. To enable it, link the zone to an existing and known RYG channel.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.
3. Under *Advanced Loop Counting with RYG Channel*, select the *RYG Channel* (between 1 and 32) you want to link to the zone.
   When advanced loop counting is enabled, TrafiSense2 will count vehicles on green, yellow and red.

   If the selected RYG channel does not exist or TrafiSense2 does not know the RYG channel, the RYG channels will not be taken into account and detection will be done as normal.

   When the RYG Channel is set to 0, advanced loop counting is disabled.
4. To save your configuration, click ✓.

17.3 Suppressing detection based on the RYG Channels

By default, presence detection for a particular zone is active when the RYG channel is Green, Yellow and Red. When detection on a particular zone is suppressed based on the RYG channel, "SU" will be displayed in the camera image.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.
3. Under *Advanced Loop Counting with RYG Channel*, do one or more of the following:
   - To suppress vehicle detection when the corresponding RYG channel is Green, turn *Count on Green* off.
   - To suppress vehicle detection when the corresponding RYG channel is Yellow, turn *Count on Yellow* off.
   - To suppress vehicle detection when the corresponding RYG channel is Red, turn *Count on Red* off.
4. To save your configuration, click ✓.

17.4 Enabling Count on Red (event) during a set time interval

Set the Red Inhibit Start Time to allow Count on Red detection for a certain time interval. After this time interval, detection will be suppressed when the RYG channel is set to Red. Together with the Count on Red detection, TrafiSense2 can also sent a Count on Red event each time a vehicle is detected.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.

3. Under *Advanced Loop Counting with RYG Channel*, do one or more of the following:
   - To allow vehicle detection when the corresponding RYG channel is Red, turn *Count on Red* on.
   - To only allow count on red detection during a set time interval, select the *Count on Red Inhibit Start Time*(between 1 and 300 seconds, default 240 seconds)
     Make sure *Count on Red* is turned on as well.
   - To also send an event each time a vehicle is detected in the presence zone when the RYG channel is set to Red, turn *Count on Red Event* on.
     Make sure *Count on Red* is turned on as well.
4. To save your configuration, click .

17.5 Example of how advanced loop counting with RYG Channels works

Configuration is as follows:

- Zone 1 is linked to RYG Channel 1. (See 17.2 *Enabling advanced loop counting*, page 55)
- Count on Green and Count on Yellow are suppressed. (See 17.3 *Suppressing detection based on the RYG Channels*, page 55).
- Count on Red and Count on Red Event are enabled and the Count on Red Inhibit Start Time is set to 30 seconds. (See 17.4 *Enabling Count on Red (event) during a set time interval*, page 55)

Advanced loop counting will work as follows:

1. When the RYG Channel for Zone 1 is set to Green or Yellow, the detection for each vehicle entering Zone 1 will be suppressed:
   - "**SU**" is displayed on Zone 1.
   - Zone 1 does not light up.
   - The presence output linked to Zone 1 is not triggered.
   - No presence event is sent.
2. When the RYG Channel for Zone 1 is set to Red, the Red Inhibit Start Time interval starts.
3. During the first 30 seconds after the RYG Channel has switched to Red, Count on Red detection is enabled. For each vehicle entering Zone 1
   - Zone 1 lights up.
   - The presence output linked to Zone 1 is triggered.
   - A presence event is sent.
4. After these 30 seconds have passed, the RYG Channel is still set to Red, but the detection for each vehicle entering Zone 1 will be suppressed:
   - "**SU**" is displayed on Zone 1.
   - Zone 1 does not light up.
   - The presence output linked to Zone 1 is not triggered.
   - No presence event is sent.

18 Vehicle presence data collection

18.1 About vehicle presence data

TrafiSense2 collects the following integrated vehicle presence data:

- Count: the number of vehicles detected per vehicle presence detection zone during an integration interval.
- Zone occupancy (i.e. presence levels): the occupancy of the zone during the last minute.

Vehicle presence data collection is enabled by default. The data is available via the database, reporting and public API.

The integrated data is then transferred from TrafiSense2 to:

- a PC, using dedicated PC tools.
- Traficon Data Tool (TDT)
- higher level management software via the public API.

18.2 Disabling vehicle presence data collection

Vehicle presence data collection is enabled by default for each presence detection zone. By disabling vehicle presence data on a particular zone, TrafiSense2 no longer generates, for that zone, the integrated data messages that are otherwise transferred to a PC, Traficon Data Tool (TDT) or a higher level management software.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.
3. Under *Presence events*, turn *Presence data* off.
4. To save your configuration, click ✓.

18.3 Defining the vehicle presence levels events

TrafiSense2 sends presence level events to the outputs. You can define the presence levels by setting the Zone occupancy (Zocc) thresholds, i.e. the occupancy of the zone during the last minute. When the thresholds are reached, the output for the corresponding presence level is triggered.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.
3. Under *Presence Events*, set the *Threshold Zocc 1* and *Threshold Zocc 2*.
4. To save your configuration, click ✓.

18.4 Disabling presence level outputs

Presence level output is enabled by default.
By disabling presence level outputs, TrafiSense2 will no longer send presence level events to the outputs.

1. In the camera image, click the vehicle detection zone.
2. Under the camera image, click ⚙.
3. Under *Presence events*, turn *Presence level* off.
4. To save your configuration, click ✓.

18.5 Changing the default vehicle presence data integration interval

The vehicle presence data integration interval is the period of time (60 s by default) over which vehicle counts are integrated.

1. Go to *Detection* > *Settings* > *Presence*.
2. Under *Presence Data*, change the *Integration interval* as required.
   To send more integrated data messages, make the *Integration interval* smaller.

   To send less integrated data messages, make the *Integration interval* bigger.

   To no longer send integrated data messages, set to *Off*.
3. To save your configuration, click .

19 Traffic data collection

> **NOTE**
>
> This function requires calibration. For traffic data collection, this can be done in 2 ways:
>
> - By defining the actual zone length, see 19.6 *Defining the zone length*, page 60.
> - By using a calibration zone, see 14 *Calibration*, page 46.

19.1 About traffic data

TrafiSense2 collects integrated data. Integrated data is an average calculated over an integration interval and available per zone (lane). The data is available via the database, reporting and API.

The following table explains the various integrated data types.

Data type	Definition	Unit
Occupancy	Occupancy	%
Confidence level	Indication of the accuracy of data based on image quality	0 -10: from bad to good
Average length	Length of the vehicles	0,1 m / 3,94 in
Headway	Time between the back of a vehicle and the back of the previous vehicle	m
Density	Number of vehicles over distance	vehicles/km
Vehicle class	Classification of vehicles according to their length	-
Vehicle count	Number of vehicles	-
Speed	Vehicle speed	km/h
Gap time	Time between the front of a vehicle and the back of the previous vehicle	s (0,1 s)

The integrated data is then transferred from TrafiSense2 to:

- a PC, using dedicated PC tools.
- the FLIR Intelligent Transportation Systems management system (Flux) for storage in the database, making the data available to the Flux operator, e.g. to create data reports.
- Traficon Data Tool (TDT)
- higher level management software via the API.

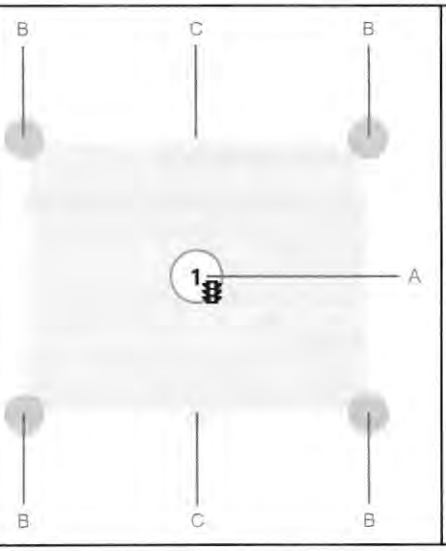
19.2 About the traffic data zones

Traffic data collection works with traffic data zones.

You can define up to 8 traffic data zones according to the following guidelines:

- Place one zone per lane.
- The zone length is +/- 8 m or 27 ft in an urban environment and 12 m or 40 ft on highways.
- The zone width corresponds to the width of a regular vehicle.
- The zone should be smaller than the traffic lane.
- The zone has a direction according to the normal direction of traffic.

As illustrated, each zone has the following characteristics:



- Zone ID **(A)**, which is automatically assigned.
- 4 zone points **(B)**
- Direction, defined by the direction points **(C)**

19.3 Adding traffic data zones

1. Go to *Detection* > *Zones*.
2. To add a traffic data zone, click and then .
3. Place and size the zone by dragging and dropping the zone points.
   Size the traffic data zone so that it is smaller than the traffic lane.
4. Set the direction of the zone by clicking one of the zone direction points.
5. To save your configuration, click .

19.4 Sending a traffic data zone to the back

When you cannot select a traffic data zone because another zone is overlapping it, you can send the overlapping zone to the back.

1. Select the overlapping zone.
2. Under the camera image, click .
3. To save your configuration, click .

19.5 Deleting traffic data zones

1. Click the zone you want to delete.
2. Under the camera image, click .
3. To save your configuration, click .

19.6 Defining the zone length

Define the actual length of the data zone to establish ground distances relative to the camera's field of view.

1. In the camera image, click the traffic data zone.
2. Under the camera image, click .
3. Turn *Calculate length* off.
4. Enter the actual *Length* of the data zone.
5. To save your configuration, click .

> **NOTE**
>
> Alternatively you can also calibrate the device using a calibration zone. See 14 *Calibration*, page 46.

19.7 Changing the default data integration settings

The default data integration settings consist of the following parameters:

- Integration interval, i.e. the period of time (60 s by default) over which data is integrated
- Integration type, i.e. the average over time (default) or over a distance

1. Go to *Detection* > *Settings*.
2. Under *Traffic Data*, adapt the following :
   - *Integration interval*
     A smaller integration interval will result in more data to be stored in the management system.

     Alternatively, to deactivate the integrated data function, select *Off*.
   - *Integration type*
     For an average over time, set the value to 0.

     For an average over distance, set the value to 1.
3. To save your configuration, click .

19.8 Defining vehicle classes

TrafiSense2 allows you to classify vehicles according to their length (5 vehicle classes) or to their width (2 vehicle classes).

19.8.1 To define vehicle classes according to their length

1. Go to *Detection* > *Settings*.
2. Under *Traffic Data* > *Vehicle classification* , do the following:
   a. Enter a *Value*, i.e. the length of the vehicle.
   b. To add another vehicle class, click + and enter the length of the vehicle.
   c. To remove a vehicle class, click − next to the corresponding vehicle class.
3. To save your configuration, click .

NOTE
Entering 1 value creates 2 vehicle classes - entering 2 values creates 3 vehicle classes:class 1 < value 1 < class 2 < value 2 < class 3 etc. **Example:** If value 1 = 4,5 m or 15 ft and value 2 = 7,5 m or 25 ft, then class 1 is below 4,5 m or 15 ft, class 2 is between 4,5 m or 15 ft and 7,5 m or 25 ft and class 3 is above 7,5 m to 25 ft.

19.8.2 To define vehicle classes according to their width

1. Go to *Detection* > *Settings*.
2. Under *Traffic Data* > *Line Counting*, turn *Use Line Counting Algorithm* on.
3. Enter the *Vehicle Width Threshold*.
4. To save your configuration, click .

NOTE
Entering the Vehicle Width Threshold creates 2 vehicle classes:class 1 < Vehicle Width Threshold < class 2 **Example:** If Vehicle Width Threshold = 2,75 m or 9 ft then class 1 is below 2,75 m or 9 ft and class 2 is above 2,75 m or 9 ft.

19.9 Setting up the detection of overspeed

TrafiSense2 generates an overspeed event when the individual speed of a vehicle exceeds a set threshold.

1. Go to *Detection* > *Settings*.
2. Under *Traffic Data* > *Traffic Data*, define the *Overspeed*.
3. To save your configuration, click .

19.10 Defining the maximum speed

This is the maximum speed that will be shown in the system even if a vehicle is detected at a higher speed.

1. Go to *Detection* > *Settings*.
2. Under *Traffic Data* > *Traffic Data*, define the *Maximum Speed*.
3. To save your configuration, click .

19.11 Enabling count events

By enabling count events, TrafiSense2 generates an event message per zone and per vehicle class. When vehicle classes are based on the length of the vehicle, 5 classes can be used. When vehicle classes are based on the width of the vehicle, 2 classes can be used. See 19.8 *Defining vehicle classes*, page 61.

1. Go to *Detection* > *Settings*.
2. Under *Traffic Data* > *Event manager*, turn *Send Count Events* on.
3. To save your configuration, click .

19.12 Enabling individual data collection

1. Go to *Detection* > *Settings* > .*Traffic Data*.
2. Under *Event manager*, turn *Individual data* on.

3. To save your configuration, click .

19.13 Disabling integrated data collection

1. Go to *Detection* > *Settings* > *.Traffic Data.*
2. Under *Event manager*, turn *Integrated data* off.
3. To save your configuration, click .

20 Flow monitoring

20.1 About flow monitoring

TrafiSense2 distinguishes between 5 levels of service that are defined by the flow speed and zone occupancy. The zone occupancy alarm level and the thresholds for dense, delayed and congested traffic are set by default, but you can change these settings per data zone.

When realistic flow speed values cannot be obtained because there is not enough traffic, TrafiSense2 provides a default flow speed. See 20.5 *Changing the thresholds for flow monitoring*, page 65.

TrafiSense2 generates an event for the levels of service 1 to 4. Flow monitoring events have an event activation and deactivation time to avoid fluctuation between levels of service when traffic is stabilizing again. You can configure the event (de)activation time per data zone. The event activation time is the time between detection of a changed level of service and activation of the event (default = 10 s). The deactivation time is the time that the level of service has returned to the previous level before deactivation of the event (default = 60 s).

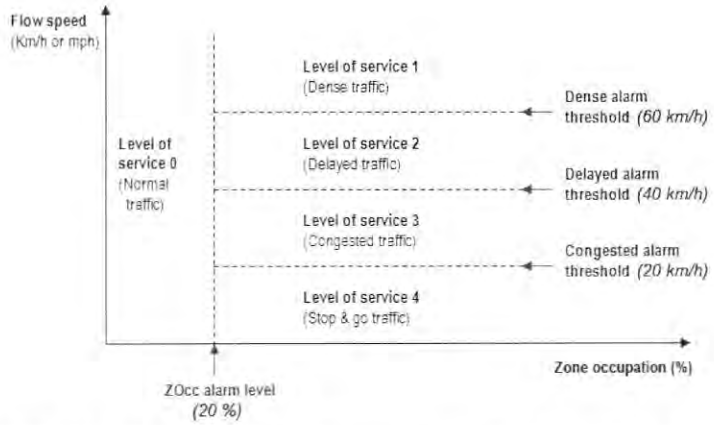


Figure 20.1 Levels of service defined by the flow speed and the zone occupancy, with their default settings

20.2 About flow data

TrafiSense2 collects flow data. The data is available via the database, reporting and API.

The following table explains the various flow data types.

Data type	Definition	Unit
Occupancy	Lane (zone) occupancy	%
Speed	Average vehicle speed based on buffered speed	km/h

The integrated data is then transferred from TrafiSense2 to:

- a PC, using dedicated PC tools.
- the FLIR Intelligent Transportation Systems management system (Flux) for storage in the database, making the data available to the Flux operator, e.g. to create data reports.
- Traficon Data Tool (TDT)
- higher level management software via the API.

20.3 Enabling flow monitoring

1. Go to *Detection* > *Settings* > .*Traffic Data*.
2. Under *Event manager*, turn *Send flow speed data* on.
3. To save your configuration, click .

20.4 Changing the default flow data settings

1. Go to *Detection* > *Settings*.
2. Under *Traffic Data*, adapt the following :

Parameter	Description
Default flow speed	Used by TrafiSense2 to avoid unrealistic data when there is no traffic over a period of time (= time to default speed). Select a value between 10 and 180 km/h. (default 90 km/h)
Time to default speed	When there is no traffic, this is the period of time (3 min by default) that will elapse before TrafiSense2 uses the Default flow speed. Select a value between 0 and 60 min.
Flow speed data send interval	Time interval (60 s by default) for transferring flow data to a PC. A smaller integration interval will result in more data to be stored in the management system

3. To save your configuration, click .

20.5 Changing the thresholds for flow monitoring

Use the zone occupancy and the thresholds for dense, delayed and congested traffic to define the various Levels of Service.

1. In the camera image, click the traffic data zone.
2. Under the camera image, click .
3. Do any of the following:
   - Type or select the *Zone occupancy* (0-99%).
   - Type or select the *Threshold* for *dense*, *delayed* or *congested traffic* (0-190 km/h).
4. To save your configuration, click .

20.6 Changing the event time on and time off

Use the event time on and off to avoid fluctuation between levels of service when traffic is stabilizing again.

1. In the camera image, click the traffic data zone.
2. Under the camera image, click .

3. Specify the following:

Parameter	Description
Time on	The time between detection of a changed level of service and activation of the event (default = 10 s, range : 1–300 s).
Time off	The time that the level of service has returned to the previous level before deactivation of the event (default = 60 s range : 1–300 s).

4. To save your configuration, click .

20.7 Setting the flow monitoring outputs

TrafiSense2 sends the Levels of Service via the speed event outputs.

For more information, see 24 *Detection outputs*, page 75.

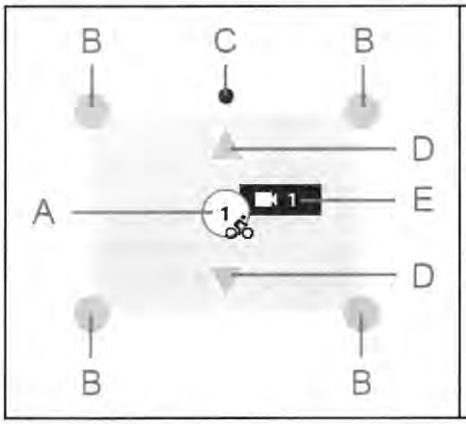
21 Bicycle presence detection

21.1 About bicycle presence detection zones

Bicycle presence detection works with bicycle presence detection zones.

With TrafiSense2, you can use up to 8 bicycle presence detection zones on a maximum of 4 lanes. The detection zone detects bicyclists that move according to the configured direction and within the configured deviation angle and ignores all cross-traffic including vehicles.

As illustrated, each zone has the following characteristics:



- Zone ID **(A)**, which is automatically assigned.
- 4 zone points **(B)**
- Direction, defined by the direction rotation point **(C)** and the direction arrow head **(D)**
- Output **(E)**
  Multiple bicycle presence detection zones can be assigned to one output.
  See 24 *Detection outputs*, page 75.

In the overlay, the direction and deviation angle are displayed as an arrow and crossed arrows as illustrated below.

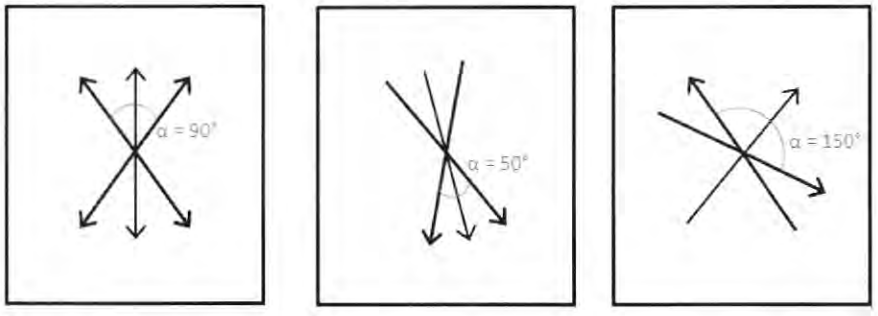


Figure 21.1 The main direction of the bicycle presence detection zone is indicated by the middle arrow. The allowed deviation is illustrated by α.

21.2 How a bicycle presence detection zone works

A bicycle presence detection zone works as follows:

1. A bicyclist entering the bicycle presence detection zone triggers detection when moving in the configured direction.
2. The detection stays triggered as long as a bicyclist is moving in the bicycle presence detection zone and in the configured direction.
3. If a bicyclist stops in the bicycle presence detection zone, the detection will remain.
4. If a bicyclist leaves the bicycle presence detection zone, the detection is dropped.

21.3 Guidelines for defining bicycle presence detection zones

- The tilt angle of TrafiSense2 should be max 45° (ideally 30°) and the pan angle max 25° left or right (ideally 0°)..
- Size and width of a bicycle presence detection zone is generally larger and wider than the zones used for vehicle presence detection:
  - Bicycle presence detection zones can cover max. 4 lanes in one direction.
  - A bicycle presence detection zone can also be used on dedicated bicycle lanes and on lanes with mixed traffic.
    It can cover a single lane as well as multiple lanes. This means you can have one zone per approach, one zone per lane and/or one zone per phase (e.g. one zone for the right turn + thru lane(s), and one zone for the left turn lane(s)).

NOTE
There is a maximum of 8 bicycle presence detection zones per TrafiSense2.

- The zone is direction sensitive
  To detect bicycles in both directions, place 2 detection zones on top of each other: 1 zone detecting in one direction and 1 zone detecting in the opposite direction.

21.4 Adding a bicycle presence detection zone

1. Go to *Detection* > *Zones*.
2. To add a bicycle presence detection zone, click + and then .
3. Place and size the zone by dragging and dropping the zone points.
   Make sure that it covers the area in which you want to detect bicyclists.
4. Change the default direction of the zone by clicking the arrow heads of the direction arrow.
   The selected direction is indicated in orange.
5. Fine-tune the direction so that it matches the direction in which bicyclists cycle through the zone using the direction rotation point.
6. To save your configuration, click .

Figure 21.2 Example of a bicycle presence detection zone

21.5 Sending a bicycle presence detection zone to the back

When you cannot select a bicycle presence detection zone because another zone is overlapping it, you can send the overlapping zone to the back.

1. Select the overlapping zone.
2. Under the camera image, click .
3. To save your configuration, click .

21.6 Deleting bicycle presence detection zones

1. Click the detection zone you want to delete.
2. Under the camera image, click .
3. To save your configuration, click .

21.7 Assigning an output to a bicycle presence detection zone

1. Click the detection zone for which you want to assign an output.
2. Under the camera image, click i/o.
3. Select an output.
   The output is added to the detection zone in the camera image.

   Outputs located on the device are indicated by .

   Outputs located on the interface are indicated by .
4. To save your configuration, click .

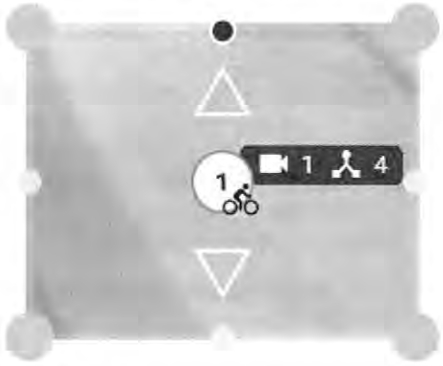


Figure 21.3 Bicycle presence detection zone with an output on TrafiSense2 and on the interface.

22 Bicycle data collection

22.1 About bicycle data

TrafiSense2 collects integrated bicycle data. This is the number of individual bicycles detected per zone during an integration interval. The data is available via the database, reporting and SDK.

Bicycle data collection is enabled by default.

The integrated data is then transferred from TrafiSense2 to:

- a PC, using dedicated PC tools.
- Traficon Data Tool (TDT)
- higher level management software via the Software Development Kit (SDK)

22.2 Guidelines for bicycle data collection

For best performance, pay attention to the following:

- Use a Wide angle sensor, i.e. TrafiSense2 390.
- Mount the sensor in an overhead position, i.e. 0° pan angle.
- To see the gaps between the bicycles, mount the sensor at a minimum height of 3,6 m / 12 ft and tilt it at a minimum angle of 30°.
- Place the bicycle detection zone(s) at a horizontal distance of 3-18 m / 10-60 ft from the sensor.
- Perform the detection on moving or free flow bicycle traffic. Avoid detection at the stop bar, where bicycles can group and wait.
- For counting in one direction, perform the detection on approaching bicycles. For counting in two directions, perform the detection on approaching and receding bicycles.

22.3 How bicycle counting works

Each bicycle leaving thee bicycle detection zone is counted. The counting is visualized as follows:

- In the overlay :In the real-time data the number of bicycles is increased
- A pulse is sent to the outputs dedicated to bicycle counting, if enabled.
  Via the pulse events time and the pulse events off time, you can define the length of the pulse and the time between 2 pulses. For more information about the outputs for bicycle counting, see 24.4 *About the pulse events (off) time for bicycle counting*, page 75 and 24 *Detection outputs*, page 75.

22.4 Deactivating data integration or changing the default bicycle data integration interval

The bicycle data integration interval is the period of time (60 s by default) over which bicycle counts are integrated.

1. Go to *Detection* > *Settings* > .*Bicycle Presence*.
2. Under *Bicycle Data* tab, change the *integration Interval* as required.
   A smaller integration interval will result in more data being stored in the management system.

   Alternatively, to deactivate data integration, select *Off*.
3. To save your configuration, click .

22.5 Disabling bicycle data collection

Bicycle data collection is enabled by default.

1. Go to *Detection* > *Settings* > *.Bicycle Presence*.
2. Under *Bicycle Data*, turn *Bicycle Data* off.
3. To save your configuration, click .

23 Detection of wrong way drivers

NOTE
This function requires calibration. See 14 *Calibration*, page 46.

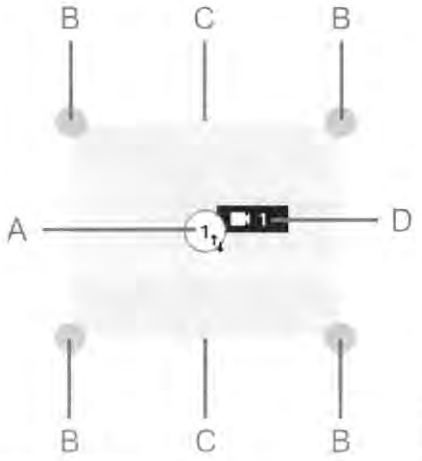
23.1 About inverse direction zones

The detection of wrong way drivers works with inverse direction zones.

You can define up to 8 inverse direction zones according to the following guidelines:

- Place one zone per lane.
- The zone length is +/- 8 to 12 m or 27 to 40 ft (ideally 10 to 12 m or 33 to 40 ft).
- The zone width corresponds to the width of a regular vehicle.
- The zone should be smaller than the traffic lane.
- The zone has a direction according to the normal direction of traffic.

As illustrated, each zone has the following characteristics:



- Zone ID **(A)**, which is automatically assigned.
- 4 zone points **(B)**
- Direction, defined by the direction points **(C)**
- Output **(E)**
  Multiple inverse direction zones can be assigned to one output. See 24 *Detection outputs*, page 75.

23.2 Adding inverse direction zones

1. Go to *Detection* > *Zones*.
2. To add an inverse direction zone, click and then .
3. Place and size the zone by dragging and dropping the zone points.
   Size the inverse direction zone so that it is smaller than the traffic lane.
4. Set the direction of the zone by clicking one of the zone direction points.
5. To save your configuration, click .

23.3 Sending an inverse direction zone to the back

When you cannot select an inverse direction zone because another zone is overlapping it, you can send the overlapping zone to the back.

1. Select the overlapping zone.
2. Under the camera image, click .

3. To save your configuration, click .

23.4 Deleting inverse direction zones

1. Click the zone you want to delete.
2. Under the camera image, click .
3. To save your configuration, click .

23.5 Assigning an output to an inverse direction zone

1. Click the detection zone for which you want to assign an output.
2. Under the camera image, click i/o.
3. Select an output.
   The output is added to the detection zone in the camera image.

   Outputs located on the device are indicated by

   Outputs located on the interface are indicated by
4. To save your configuration, click .

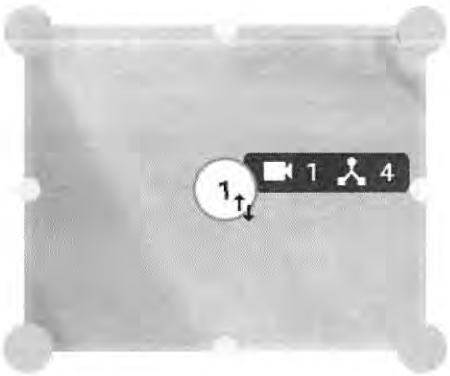


Figure 23.1 Bicycle presence detection zone with an output on TrafiSense2 and on the interface.

23.6 Changing the detection sensitivity settings

1. In the camera image, click the inverse direction zone.
2. Under the camera image, click .

3. Set any of the following parameters:

Parameter	Default	Recommendation
Detection threshold	2	Set to a higher value to decrease detection sensitivity (stepwise change +/- 1).
Occlusion	0 %	Set to a higher value in a situation with strong occlusion. Typically 50 % refers to an occluded zone (stepwise change +/- 10).
Negative threshold	30	Set these threshold lower for a low contrast image to increase detection sensitivity. Increase the thresholds to avoid influence from light reflection (stepwise change +/- 5).
Positive threshold	40	

4. To save your configuration, click .

23.7 Deactivating detection suppression

By default, a wrong-way driver must be detected over the entire zone before the inverse direction detection is valid.
In cases where you get unwanted inverse direction events, you can deactivate detection suppression.

1. In the camera image, click the inverse direction zone.
2. Under the camera image, click .
3. Turn *Zone coverage* off.
4. To save your configuration, click .

24 Detection outputs

24.1 About the outputs

Instead of assigning the outputs each time you define zones, you can also assign them all at once.

The *Outputs* page displays all vehicle and bicycle detection zones, traffic data zones and inverse direction zones and their output assignment as well as the outputs for occupancy, presence level and recall.

TrafiSense2 sends presence detection events via the detection outputs. The number of available detection outputs depends on the system architecture:

- BPL installation with TI BPL2 EDGE interface: up to 4 outputs
- BPL installation with TI BPL2 EDGE interface and maximum 4 4I/O USB: up to 4 outputs on the interface + 4 outputs and 4 inputs per 4I/O USB — in total max. 20 outputs and 16 inputs.
- BPL installation with PIM module: up to 64 outputs.

24.2 Normal status of the detection outputs

Presence detection, traffic flow monitoring and inverse direction events are sent to the traffic controller via the interface. By default, the assigned outputs will close on presence detection/traffic flow monitoring/inverse direction events. Unassigned outputs are open. You can change the default settings for both assigned and unassigned outputs.

24.3 About the logical relation

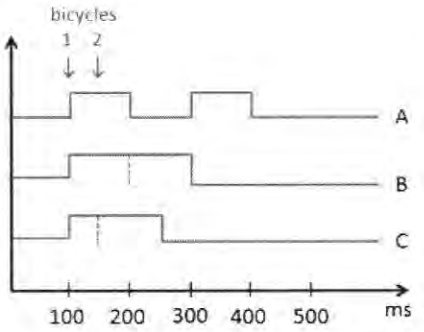
Logical relations only apply to the presence detection outputs. When multiple presence detection zones are assigned to the same output, a logical relation (Boolean logic) applies:

- OR (default): presence detection on one of the zones assigned to the output will change the status of the output.
- AND: presence detection on all zones assigned to the output is required before the output changes status.

24.4 About the pulse events (off) time for bicycle counting

For each count, a pulse is sent to the outputs dedicated to bicycle counting for that zone. The length of this pulse is defined in the *Pulse Events Time*.

When multiple bicycles leave the zone at the same time, multiple pulses are sent. To be able to count these pulses via the outputs, there has to be a pause in the pulses. You can define this pause, i.e. the time between 2 simultaneous pulses, in the *Pulse Events Off Time*.



Pulse events time = 100 ms Situation

- A - Pulse events off time = 100 ms
  When bicycle 1 is detected, the first pulse is sent, followed by a pause of 100ms (the pulse events off time) and a second pulse for bicycle 2. This situation allows you to use the outputs for counting.
- Situation B - Pulse events off time = 0 ms
  When bicycle 1 is detected, the first pulse is sent. The second pulse for bicycle 2 follows immediately after the first pulse, without a pause.
- Situation C - Pulse events off time = -1 ms
  When bicycle 1 is detected, the first pulse is sent, as soon as bicycle 2 is detected, the first pulse is ended and the second pulse is sent for bicycle 2

NOTE
Pulse events are also linked to inverse direction events.

24.5 Testing the outputs manually

1. Go to *Configuration* > *Outputs*.
2. Click *Test Mode*.
3. To start the test, click ▶.
4. Test the outputs by clicking them.
5. To stop the test, click ■.

24.6 Configuring the detection outputs

The detection outputs allow you to change the normal output status and the assignment of the presence detection, traffic flow monitoring (speed) events, thermal quality recall (bad video) and detection quality recall (bad presence detection quality) to one or multiple outputs.

1. Go to *Configuration* > *Outputs*.
2. To set the unassigned outputs to closed, turn *Unassigned Outputs Open* off.
3. Select an output
   Alternatively, to get an overview of all outputs and their assignment, select *Matrix*.

NOTE
None of the outputs on TrafiSense2 are assigned by default !

4. In the *Outputs* tab, do one of the following:

Goal	Action
To set the outputs to open on presence detection	Set *On event* to *Open*
To set the logical relation to AND (for presence detection outputs only)	Select *AND* as the *Logical relation*.
To enable *Pulse mode*	Select *Entry*, *Exit* or *Periodic* and change the *Pulse time* if necessary.
To assign the *Presence* detection outputs	Select the *Zone ID* checkboxes.
To assign the *Presence Count on Red* outputs	Select the *Zone ID* checkboxes.
To assign thermal quality *Recall* to the outputs	Select the checkbox(es) for *Bad video*.
To assign detection quality *Recall* to the outputs	Select the checkbox(es) for *Bad presence detection quality*.
To assign outputs to the vehicle *Presence levels* (Zocc)	Select the *Level 1* and *Level 2* checkboxes.
To assign *Speed event* outputs	Select or clear the *Level* checkboxes.
To assign *Overspeed* outputs	Select the *Zone ID* checkboxes.
To assign *Count Event* outputs	Select the *Class* checkboxes for each zone.
To assign the *Bicycle Presence* detection outputs	Select the *Zone ID* checkboxes.
To assign the *Bicycle Counting* outputs	Select the *Zone ID* checkboxes.
To set the length of the pulses for bicycle counting / inverse direction	At the top of the *Outputs* page, define the *Pulse events time* (range 1 to 1000000 ms).
To set the time between two simultaneous pulses for bicycle counting / inverse direction	At the top of the *Outputs* page, define the *Pulse events off time* (range –1 to 10000 ms).
To assign the *Inverse direction* outputs	Select the *Zone ID* checkboxes.

5. To save your configuration, click .

25 Displaying settings for overlay

Define what you want to display as overlay on the camera image or on the streaming video as follows:

1. Go to *Configuration > Display.*
2. In the Display page, turn the following display items on or off as required:

NOTE
When you enable items, the switch is turned on, i.e. it shifts to the right and turns orange. When you disable items, the switch is turned off, i.e. shifts to the left and turns grey.

General	*Device name display*	Displays the name of the device as defined under *General > Settings*
	IP address display	Displays the IP address as defined under *Configuration > Network*
	Clock display	Displays the date (MM/DD/YYYY) and time (hh:mm:ss tt, i.e. 12h format with AM/PM) as defined under *General > Time*
	Thermal quality display	Displays the current thermal quality level
	Version display	Displays the firmware version of the TrafiSense2 device
	Thermal core channel	Displays the thermal region of interest, as defined in *Configuration > Camera*
Vehicle presence detection	*Presence channel*	Displays the vehicle presence detection zones (already displayed by default)
	Presence quality	Displays the vehicle detection quality threshold
Vehicle presence data collection	*Real-time Presence Data*	Displays the vehicle presence data, i.e. Count and Zone Occupancy
	Flow Speed Data	Displays the Zone Occupancy and Level of Service for each traffic data zone.
Traffic data collection	*Traffic Data Area*	Displays the traffic data zones
	Real-Time Traffic Data	Displays the traffic data in realtime
	Overspeed Data	Displays "Overspeed" when a vehicle with overspeed is detected in the traffic data zone
Bicycle presence detection	*Bicycle Presence zones channel*	Displays the bicycle presence detection zones (already displayed by default)
	Bicycle presence bicycles channel	Displays a cross following the detected bike (already displayed by default)
Bicycle presence data	*Real-time Bicycle Data*	Displays the real-time bicycle data (Count).
Inverse direction detection	*Inverse Direction area*	Displays the inverse direction zones (already displayed by default)
	Inverse Direction event manager	Displays the event
RYG channels (only with PIM)	RYG Channel Status	Displays the status of the traffic lights (Red, Yellow, Green)

3. In the camera image, drag the orange text boxes to where you want to display the overlay.
4. To save your configuration, click .

5. Do one of the following:
   - To display the overlay on the sensor image, refresh the image.
   - To display the overlay on streaming video, start streaming video.
     See 30.3 *Viewing streaming video via de web interface*, page 89.

26 Recall

TrafiSense2 has a recall function for:

- startup
- thermal quality
- vehicle detection
- vehicle detection quality

You can assign one or multiple outputs to the thermal quality recall and detection quality recall function. See 24 *Detection outputs*, page 75.

26.1 About time-out

The recall function is characterized by its time-out parameter. The time-out is an adjustable period of time that passes before the outputs assigned to recall will change status.

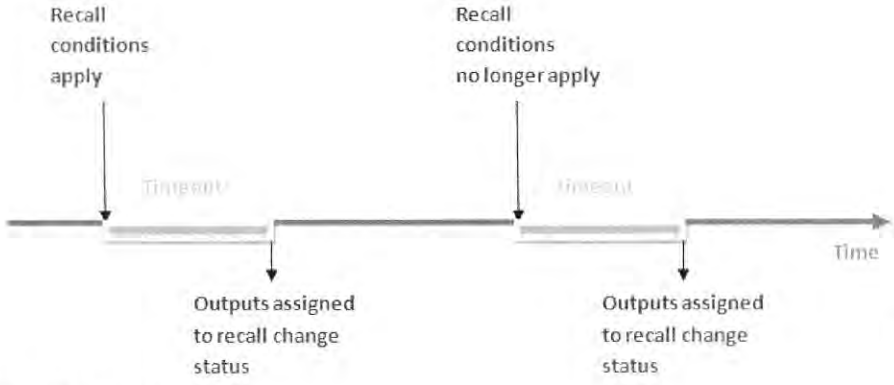


Figure 26.1 Recall time-out

26.2 Adapting the recall settings

1. Go to *Detection* > *Settings*.

2. Adapt the following settings as required:

Recall Type	Description & Action
Startup	TrafiSense2 goes into recall when the device has just become operational, after the learning time. To adapt the learning time, change *Presence > Startup recall time-out*.
Thermal quality	TrafiSense2 goes into recall when the quality of the thermal image has dropped below a set threshold. To adapt the threshold and time on/off, switch to the *Thermal Quality* pane and change the *Threshold* (Default 20), *Time on* (Default 2) and *Time off* (default 2). **NOTE** • With a higher threshold, the system is more sensitive to the deterioration of the thermal image. • When the threshold is set to 0, thermal quality recall is disabled and no events are created. To reset the thermal quality algorithm, e.g. when the TrafiSense2 device is moved from its installation position, click *Reset Thermal Quality*.
Vehicle detection	TrafiSense2 goes into recall when no vehicles have been detected during a set period of time. To adapt this period of time, change *Presence > Detection recall time-out*. To deactivate vehicle detection recall on a particular zone, go to the zone settings and turn *Fail safe* off.
Vehicle detection quality	TrafiSense2 goes into recall when the quality of the vehicle presence detection has dropped below a set threshold. To adapt the threshold and time-out, change *Presence > Quality > Threshold* and *Time-out*

3. To save your configuration, click .

26.3 Assigning thermal quality recall or detection quality recall to one or multiple outputs

NOTE

By default, recall is NOT activated on output level.

For more information, see 24 *Detection outputs*, page 75.

27 Working with existing configurations and offline networks

27.1 About sending configurations and startup recall

The configuration file contains all settings that determine the operation of the TrafiSense2 device or the TI BPL2 EDGE interface.

After setup or with each change you make, you must send the configuration to TrafiSense2 or to the interface to make it operational by clicking .

TrafiSense2 starts a learning cycle.

See 26 *Recall*, page 80.

27.2 About offline networks

An offline network is a copy of the TrafiSense2 network created in the web interface. The offline network is saved as a compressed network file. The file may serve as a backup, or can be used to prepare the configuration offline. The offline configuration of selected devices can be loaded again. You can also use offline networks to manage multiple configurations for a device.

27.3 Exporting and importing a configuration or offline network

1. Go to *Administration* > *General*.
2. Switch to the *Import/Export* pane.
3. Do one of the following:
   - To download a configuration, select *Configuration* and click *Download*.
   - To upload a configuration, select *Configuration* and click *Upload*.
   - To download an offline network, select *Offline Network* and click *Download*.
   - To upload an offline network, select *Offline Network*, click *Upload*, select the offline network, click *Send* and then *Reload*.

NOTE
Offline networks can only be uploaded on TI BPL2 EDGE, not on TrafiSense2.

4. To save your configuration, click .

27.4 Restarting TrafiSense2 with the current or factory default configuration

1. Go to *Administration* > *General*.
2. Under *Settings*, do one of the following:
   - To return to the configuration that was last saved, click *Reload Configuration*.
   - To reset the configuration to the default values, click *Reset to Default*.
   - To restart TrafiSense2 with the current configuration, click *Reboot*.

28 Communication protocol: public API

28.1 About the Public API manual

To integrate your TrafiSense2 into your own software, please refer to the FLIR ITS Public API Manual.

The API is a REST API combined with WebSockets for subscriptions. The protocol uses basic HTTP GET and POST for communication.

28.2 Accessing the Public API manual

1. Open a web browser.
2. In the address field, enter *<device_ip_address>*/api and press Enter.

28.3 General functionality

The following messages are general for all FLIR ITS devices:

URL	Purpose
<device_ip_address>/api/device/info	To retrieve information from the device itself, such as company name, device name, product type, firmware version.
<device_ip_address>/api/device/time	To get and send the current time from and to the device.
<device_ip_address>/api/device/uptime	To know how long the device has been running.
<device_ip_address>/api/image/current	To retrieve the current (static) image from the device.
<device_ip_address>/api/image/event/:eventNumber	To retrieve an image for a certain event.
<device_ip_address>/api/subscriptions	To (un)subscribe to events and data.

For more information about these general messages, please refer to the FLIR ITS Public API Manual.

28.4 Supported events types

Events are notifications about certain traffic or technical situations that have been detected by the device.

To get an overview of the event types supported by the device, enter the following in the address field of the web browser:

<device_ip_address>/api/events/supported

TrafiSense2 supports the following event types:

- Presence
- Presence Count on Red
- Bad Video
- Bad Presence Quality
- Presence Level
- Speed Alarm
- Overspeed
- Vehicle Count
- Bicycle Presence
- Bicycle Count
- Wrong Way Driver, including speed of wrong way driver
- Stop
- Configuration

- Firmware Update

For more information about these event types, please refer to the FLIR ITS Public API Manual.

28.5 Supported data types

Data is a periodical message about the detected traffic conditions. It can include things like number of vehicles, average speed, etc.

To get an overview of the traffic data types supported by the device, enter the following in the address field of the web browser:

<device_ip_address>/api/data/supported

TrafiSense2 supports the following data types:

- Integrated Data
- Individual Data
- Flow Speed Data
- Presence Data
- Bicycle Data

For more information about these data types, please refer to the FLIR ITS Public API Manual.

29 Data transfer from TrafiSense2 to a PC using Traficon Data Tool

29.1 Data storage on TrafiSense2

TrafiSense2 can store data up to one month, taking into account the following configuration:

- 4 traffic data collection zones, with events and traffic data enabled
- 16 presence detection zones with presence data enabled
- 5–minute integration interval

Alternatively, TrafiSense2 can also store bike data up to one month, taking into account the following configuration:

- 4 zones
- 3–minute interval

29.2 About Traficon Data Tool

The Traficon Data Tool allows you to download or monitor data and events generated on FLIR devices on your network and view them in xml or Excel format.

29.3 Installing and starting Traficon Data Tool

Traficon Data Tool is available from the installation CD delivered with the FLIR devices.

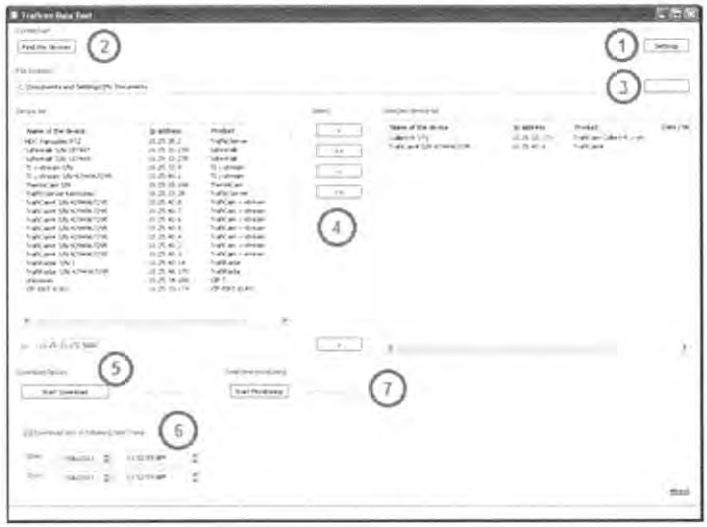
1. Insert the Traficon Data Tool installation CD in the CD-ROM drive.
2. Go to the installation of Traficon Data Tool.
3. Follow the instructions provided by the installation wizard.
4. To complete the installation, click *Finish*.
5. To start Traficon Data Tool, choose *Start* > *All programs* > *Traficon Data Tool* > *Traficon Data Tool*.

29.4 Main window

As illustrated below, the main window of the Traficon Data Tool will guide you through the various steps for downloading or monitoring the data and events. Click a step to jump to the procedure described in the next chapter.

1. Defining the download settings.
2. Finding the devices.
3. Defining where to store the downloaded files.
4. Selecting the devices.
5. Downloading the data and events history.
6. Downloading data and events in a particular time frame.

7. Monitoring data and events in real time.



29.5 Working with Traficon Data Tool

29.5.1 Defining the download settings

In the Download settings, you can define a broadcast and connection timeout, whether to download events and/or data and what system of units will be used when converting this raw xml data to Excel.

1. Under *Connection*, click *Settings*.
   The Settings dialog is displayed.

2. To download *Events* and/or *Data*, select the relevant checkbox(es).
3. Select the *System of units* you want to use when data is displayed in Excel.
4. Define the *Broadcast timeout*, i.e. the time Traficon Data Tool will wait for an answer when scanning the network for devices.
   If there are a lot of different devices on the network or poor connection quality, we advise to increase the broadcast timeout.
5. Define the *Connection timeout*, i.e. the time Traficon Data Tool will wait for an answer during all other communication with the devices.
6. To save the settings, click *OK*.

29.5.2 Finding the devices

To scan the network for devices, under *Connection*, click *Find the devices*.

Traficon Data Tool searches for all devices on the network and displays them in the *Device list*.

The devices are sorted according to their name.

29.5.3 Defining where to store the downloaded files

1. Under *File location*, click ...
   The *Browse for folder* dialog is displayed.
2. Select the folder to download the data to.
   Alternatively, to create a new folder, click *Make new folder*.

   When downloading the data, Traficon Data Tool will create a subfolder per device, according to the following syntax *<name>_<IP address>_<Port>*
3. Click *OK*.

29.5.4 Selecting the devices

You can select devices by moving them to the *Selected device* list.

- To add devices to the *Selected device list*, do one of the following:
  - Select 1 or more (using Shift or Ctrl) devices in the *Device list* and click >.
  - To add all devices to the *Selected device list*, click >>.
- To remove devices from the *Selected device list*, do one of the following:
  - Select 1 or more (using Shift or Ctrl) devices in the *Selected device list* and click <.
  - To remove all devices from the *Selected device list*, click <<.
- To be able to collect data from devices behind a router, enter the IP address and port (*<IP>:<port>*) of these devices and click >.

29.5.5 Downloading the data and events history

1. To start downloading the data and events history, click *Start download*.
   If this is the first history download, Traficon Data Tool will start downloading from the oldest line in the database onwards.

   If this is not the first history download, Traficon Data Tool will start where the previous download was stopped.
2. To stop downloading the data and events history, click *Stop download*.
   The download files (in xml and Excel/csv format) are saved in the predefined folder (see 29.5.3 *Defining where to store the downloaded files*, page 87) and the downloaded data is deleted from the database on the device.

29.5.6 Downloading data and events in a particular time frame

Use this function if you want to download data and events from a particular period, e.g. in case of a communication error between the detection module and FLUX, caused by a third party while e.g. working on a traffic pole.

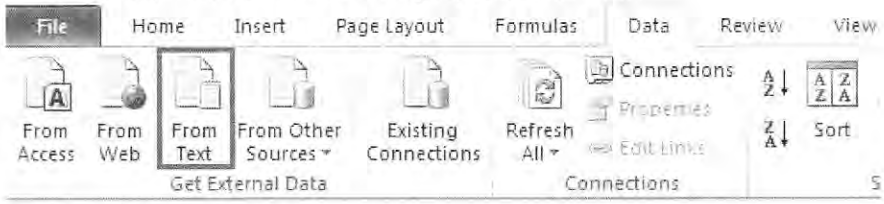
1. Select *Download only in the following time frame*.
2. Enter a start date and time for downloading the data and events.
3. Enter an end date and time for downloading the data and events.
4. To start downloading the data and events for the selected time frame, click *Start download*.
   The download files (in xml and MS Excel/csv format) are saved in the predefined folder (see 29.5.3 *Defining where to store the downloaded files*, page 87) and the downloaded data is deleted from the database.

29.5.7 Monitoring data and events in real time

1. To start monitoring the data and events in real-time, click *Start monitoring*.
   From this moment onwards, Traficon Data Tool will save all new incoming data and/or events (as defined in the download settings) in xml and Excel/csv format in the predefined folder (see 29.5.1 *Defining the download settings*, page 86 and 29.5.3 *Defining where to store the downloaded files*, page 87).
2. To stop monitoring the data and events in real-time, click *Stop monitoring*.

29.5.8 Converting a .csv file to an .xls file via MS Excel

1. Open MS Excel.
2. In the *Data* tab, in the *Get External Data group*, click *From Text*.



3. Double click the .csv file you want to import.
4. Follow the instructions in the *Text Import Wizard*:
   a. In step 1, set the original data type to *Delimited* and click *Next*.
   b. In step 2, under *Delimiters*, clear *Tab* and select *Comma* and click *Finish*.
5. Select where you want to put the data and click *OK*.
6. Save the resulting file as an .xls file.

Date	Time	Lane	BicycleCount (# bicycle)
14/04/2009	18:00:00	1	2
14/04/2009	18:00:00	2	3
14/04/2009	18:01:00	1	3
14/04/2009	18:01:00	2	3
14/04/2009	18:02:00	1	3
14/04/2009	18:02:00	2	5
14/04/2009	18:03:00	1	0
14/04/2009	18:03:00	2	0
14/04/2009	18:04:00	1	2
14/04/2009	18:04:00	2	1

Figure 29.1 Example of an .xls file with integrated bicycle data from 2 lanes, the integration interval is 60 s.

30 Streaming video

30.1 About streaming video

TrafiSense2 uses MPEG-4, MJPEG or H264 compression technology to provide real-time streaming video over the network.

The bit rate and frame rate have default settings (Bit rate is set to 2 Mbit/s and frame rate is set to 29.97 fps) but are configurable.

You can view streaming video via web interface or any video player accepting rtsp stream, e.g. VLC Media Player.

The streaming video is ONVIF Profile S compliant.

NOTE
The ONVIF Discovery Tool will only work on TrafiSense2 ETH.

30.2 Changing the default video settings

1. Go to *Configuration* > *Video*
2. To define the first video stream:
   a. Select the *Codec* (MPEG4, H264, MJPEG).
   b. Define the *Bit rate* (range: 0,01 to 8 Mbit/s, default 2).
   c. Define the *Frame rate* (1 to 30 fps, default 29,97).
   d. To use multicast, turn on *Multicast* and fill in the following fields:
      - *Multicast group*, i.e. the IP address (in the 239.x.y.z range) used for multicast.
      - *Multicast TTL* (Time To Live) : This indicates how long the data should be sent, i. e. the number of routers the data is allowed to pass:
        - 0: restricted to the same host. The data will not be sent by any interface.
        - 1-255: the number of routers (hops) the video stream is allowed to pass.

NOTE
Multicast is not supported for BPL.

   e. Alternatively, to use unicast, clear *Multicast*.
3. To define a second video stream, repeat step 2 for *Video Compression 2*.
4. To save your configuration, click .

30.3 Viewing streaming video via de web interface

The *Live View* page displays live video from TrafiSense2.

As illustrated below, the Live View page allows you to:

- Pause or play the live video
- Display the status of the outputs to verify detection
  - Orange: Output is triggered by detection.
  - Grey: Output is not triggered.

NOTE
When detection zones and outputs are not configured, the status of the outputs will remain unchanged.

Figure 30.1 Live View page

30.4 Viewing and recording streaming video via VLC media player

30.4.1 About VLC media player

VLC media player is a third-party software, free of charge, to view streaming video from any PC connected to the TrafiSense2 network. Via this software, you can also record streaming video and view recordings.

VLC media player is available on the Web. The instructions below apply to VLC Media Player V2.0.0. FLIR Intelligent Transportation Systems cannot guarantee that these instructions will also work on other versions of VLC Media Player.

30.4.2 To view streaming video via VLC media player

1. Choose *Media* > *Open Network Stream.*
2. Set the *Protocol* to *RTSP.*
3. Enter the IP *Address* of TrafiSense2.
   - To show video encoder 1, enter the default "rtsp://<*IP address*>" or "rtsp://<*IP address*>/?video=1".
     The default "rtsp://<*IP address*>" also shows video encoder 1.

     By default, this video stream contains overlay but is configurable.
   - To show video encoder 2, enter "rtsp://<*IP address*>/?video=2".
     This video stream does not contain overlay.

4. Click *Play*.

30.4.3 To record streaming video via VLC media player

1. Choose *Media* > *Streaming*.
2. Click the *Network* tab.
3. Set the *Protocol* to *RTSP*.
4. Enter the *IP Address* of TrafiSense2.
   - To record video encoder 1, enter the default "rtsp://<*IP address*>" or "rtsp://<*IP address*>/?video=1"
     The default "rtsp://<*IP address*>" also shows video encoder 1.

     By default, this video stream contains overlay but is configurable.
   - To record video encoder 2, enter "rtsp://<*IP address*>/?video=2".
     This video stream does not contain overlay.
5. Click *Stream*.
6. Click *Next*.
7. Under *Destinations*:
   a. Click *Add*.
   b. Click *Browse* and enter the *File name* with extension **.mpg** (e.g. Recording_C1.mpg).
   c. Click *Save*.
8. Under *Transcoder Options*:
   a. Set the *Profile* to *Video - MPEG-4 + AAC (MP4)*.
   b. Click the *Edit Selected Profile* button .
   c. In the Encapsulation tab, select *MPEG-TS*.
   d. In the Video Codec tab, set *Codec* to *MPEG-4*.
   e. Click *Save*.
9. Click *Stream*.
10. If required, provide a user name and password.
11. To stop the recording, click the *Stop playback* icon .
    To view a recording via VLC media player, double-click the recorded file.

30.5 Viewing streaming video via ONVIF Profile S

TrafiSense2 supports Onvif Profile S. Connect with default user "admin' and Password 'admin".

31 Product security

31.1 About product security

By default, TrafiSense2 is not secured to ensure compatibility with other existing systems.

Take the following steps for basic product security :

1. Disable unsecure services as necessary. See 31.2 *Enabling or disabling services*, page 92.
2. Enable user authentication and change the default password. See 31.3 *User authentication*, page 92.
3. Adapt the wifi password. See 12.2 *Adapting the Wi-Fi settings*, page 43.

31.2 Enabling or disabling services

The Services page gives you an overview of what is accessible from outside the product. By default, all services are enabled.

1. Go to *Administration* > *Product security*.
2. In the *Services* page, select the services you want to enable and clear the services you want to disable:
   - XML2 (unsecure) vs. XML2 over TLS (secure).
     Used for communication with Traficon Configuration Tool and Flux. Over TLS, communication is encrypted and not readable for others.
   - HTTP (unsecure) / HTTPS (secure)
     Used for public API and video streaming via VLC.
   - FTP (unsecure)
     Used for firmware updates. When disabled, firmware can still be updated via the web interface.
   - ONVIF (unsecure)
     Used by network tools to find devices and request information from them
   - RTSP Video streaming (unsecure)
     Used for video streaming via other tools.
   - HTTPS (secure)
     Used for public API and video streaming.
   - XML2 discovery (secure)
     Used to scan network.

NOTE
Disabling a parent item will also disable the underlying items.

3. To save your configuration, click .

31.3 User authentication

To limit access to device and its video streams, you can enable user authentication. Only users defined under *Administration* > *Users* will be able to logon to the device.

1. Go to *Administration* > *Product security*.
2. Switch to the *User Authentication* page.
3. Do one of the following:
   - To enable user authentication on the video stream, select *RTSP*.
   - To enable user authentication on the entire device, select *Authentication*.

4. To save your configuration, click .

31.4 Physical access

Depending on your product, select the physical access that is required. By default, all ports are enabled.

1. Go to *Administration > Product security.*
2. Switch to the *Physical Access* page.
3. Do one of the following :
   - Clear the ports you do not need to disable them.
   - Select the ports you need to enable them.

NOTE
Disabling a parent item will also disable the underlying items.

CAUTION
When restricting physical access to the product (by disabling services), make sure you do not lock yourself out !

4. To save your configuration, click .

31.5 Certificates

31.5.1 Self-signed vs. CA-signed certificates

A device generates a certificate that describes its identity. The unique identifier on TrafiSense2 is its IP address. This certificate is only valid for this specific IP address. The device also generates a private key that it uses to sign the certificate. This results in a self-signed certificate. Self-signed certificates are not trusted by browsers, there is no way to verify that the device is who it claims to be.

As a solution, CA-signed certificates are generated and signed by a CA (Certificate Authority), i.e. an organization that is "trusted". On the public internet, there are several CA's that are trusted by all major browsers. In a private network, the company that owns the network can be its own CA.

31.5.2 Implementing certificates for TrafiSense2

By default, our products use self-signed certificates. This means that the communication is encrypted, but the browsers cannot trust the device. For trusted certificates, you should first generate a CA certificate and CA private key for your organization and use this CA certificate to sign a device certificate.

This can be done in 2 ways:

- Set certificate
- Sign certificate

31.5.2.1 Set certificate

1. Generate the device (also called 'end-entity) certificate and private key.
   The certificate should contain at least the device's current IP address.

NOTE
The certificate is only valid for this specific IP address.

2. Sign the device certificate with your CA certificate and CA private key.
3. Go to *Administration* > *Product security*.
4. Switch to the *Certificates* page.
5. Under *Set certificate*, do the following:
   a. To upload the signed device certificate, click *Select Certificate* and locate it.
   b. To upload the device private key, click *Select Private Key* and locate it.
   c. Click *Send*.

31.5.2.2 Sign certificate

1. Go to *Administration* > *Product security*.
2. Switch to the *Certificates* page.
3. Under *Sign certificate*, do the following:
   a. To upload your CA certificate to the device, click *Select Certificate* and locate it.
   b. To upload your CA private key to the device, click *Select Private Key* and locate it.

NOTE
The certificate is only valid for the current IP address.

   c. To save the CA private key on the device, select *CA private key*.
   In case the device's IP address changes, the device will re-generate and re-sign its own certificate to be valid. This is option is not safe but can be useful for smaller setups.
   d. Click *Send*.

   The device will sign its own certificate with the provided CA certificate and CA private key. If the device is an interface, all connected devices will also be signed.

31.6 Exporting the physical access log

The physical access log gives you an overview of when the various ports were enabled or disabled and when there was a connection to or a disconnection from these ports . You can export the log as follows:

1. Go to *Administration* > *Product security*.
2. Switch to the *Physical Access Log* page.
3. Click *Export All*.
   The physical access log is downloaded as a .csv file.

31.7 Exporting the user log

The user log gives you an overview of the users that logged in or out on the device:

1. Go to *Administration* > *Product security*.
2. Switch to the *User Log* page.
3. Click *Export All*.
   The user log is downloaded as a .csv file.

32 Maintenance and troubleshooting

32.1 Periodic maintenance

FLIR Intelligent Transportation Systems recommends performing the following maintenance tasks once per year. Depending on the on-site conditions, you may need to increase the frequency of maintenance.

Maintenance task	Tools required	Note
Clean the faceplate of TrafiSense2	Soft cotton cloth dampened with fresh water. Do not use abrasive materials, such as paper or scrub brushes as this will possible scratch and damage the lens. Only wipe the lens clean when you visually see contamination on the surface. 1. Immerse lens tissue (optical grade) in one of the following solvents as required: • Acetone: for removal of grease • Ethanol (reagent grade): for removal of fingerprints and other contaminants • Alcohol: for final cleaning before use 2. With a new tissue each time, wipe the lens in an "S" motion so that each area of the lens will not be wiped more than once. 3. Repeat until the lens is clean. Use a new tissue each time.	Avoid moving the device.
• Check the camera image • Verify the configuration of the system • Save a backup of the system (offline network)	PC with web browser	For guidance, consult the user guide.

32.2 Firmware upgrade of TrafiSense2

NOTE
When TrafiSense2 is connected to an interface, update the firmware via the interface.

1. Go to *Administration* > *Firmware*.
2. Click *Select Firmware*, locate and select the new firmware file and click *Open*.
3. Click *Upgrade*.
   The firmware is uploaded and the device is programmed and rebooted.
4. When the device was upgraded successfully, refresh the TrafiSense2 web page by clicking *Reload*.

32.3 Technical Event log

The technical event log gives you an overview of all the technical events that occurred on TrafiSense2. The Technical Event Log page allows you to sort, filter, reload and export the event log.

1. Go to *Administration* > *Technical Event Log*.
2. In the Technical Event Log page, do one of the following:
   - To sort the technical event log, click a column: *Device*, *Event Type*, *State*, *Timestamp*.
     Click once to sort in ascending order, click twice for descending order.
   - To filter the event log:
     a. click *Show Filter*.
     b. Under *Level*, clear the check boxes of the event types you do not want to see.
     Alternatively, to show all event types again, click *Reset Filter*.
     c. To close the filter, click *Hide filter*.
   - To load the latest version of the event log, click *Reload*.
   - To export the entire event log as a .csv file, click *Export All*.

32.4 System log

You can download the system log file and send it to FLIR Intelligent Transportation Systems for evaluation:

1. Go to *Administration* > *System Log*.
2. In the System Log page, click *Download System Log*.
   The system log is downloaded as a .csv file.

32.5 Replacing a TrafiSense2 device

Replacing a TrafiSense2 device consists of the following tasks:

1. Uninstalling the broken device
2. Installing the replacement device
3. Making the replacement device operational.

For details on the installation tasks, see 6 *Installation procedure*, page 20.

32.5.1 To uninstall the broken TrafiSense2 device

1. Turn off the power.
2. To remove the mounting bracket (and TrafiSense2) from the pole, cut the retaining straps or unscrew the bolts.
3. Remove the connector with cable from TrafiSense2.

> **NOTE**
>
> Do not open the TrafiSense2 device. Warranty is no longer valid once the device has been opened.

32.5.2 To install the replacement TrafiSense2 device

1. Mount the replacement device.
   Try to position the replacement device in the same way as the broken device was positioned so that the replacement device covers the same area.
2. Reconnect the connector with cable.
3. Turn the power on.

32.5.3 To make the replacement device operational

Connect to the replacement device and send the configuration of the broken device to the replacement device. In addition, double-check the configuration: the replacement device may have a slightly different camera position, so you may need to reposition the presence

detection zones. For BPL installation, you also need to verify the error outputs assigned to the replacement device.

The configuration of the broken device is available via the system backup (offline network).

1. Connect the PC to the TrafiSense2 network and open the web interface of the replacement device.
   See 10 *TrafiSense2 web interface*, page 41.
2. For BPL installation, in the web interface of TI BPL2 EDGE, go to *Configuration* > *Network* > *BPL* and click *Apply* to adapt the *Channel*.
3. To send the configuration of the broken device to the replacement device:
   a. Go to *Administration* > *General* > *Import/Export*.
   b. Select *Offline Network* and click *Upload*.
   c. Select the offline network en click *Open*.
   d. Click *Send*.
   e. Click *Reload*.
4. To verify the error output of the replacement device:

NOTE
Error outputs are only available in BPL installation.

   a. Open the web interface of TI BPL2 EDGE.
   b. Go to *Configuration* > *Error Outputs*.
   c. Verify and reassign the error outputs if required.
   d. To save your configuration, click ✓.

NOTE
To reposition the presence detection zones: 1. Open the web interface of the replacement device. 2. On the camera image, verify the position of the presence detection zones and reposition them if required. 3. To save your configuration, click ✓.

32.6 Replacing a TI BPL2 EDGE device (BPL only)

Replacing a TI BPL2 EDGE device comprises the following tasks:

1. Uninstall the broken device
2. Install the replacement device
3. Configure the replacement device.

For details on the installation tasks, see 6 *Installation procedure*, page 20.

32.6.1 To uninstall the broken TI BPL2 EDGE device

1. Di sconnect TI BPL2 EDGE from the network.
2. Loosen the screws and take the device out of the rack.
3. Remove all connectors from the backplane of TI BPL2 EDGE.

32.6.2 To install the replacement TI BPL2 EDGE device

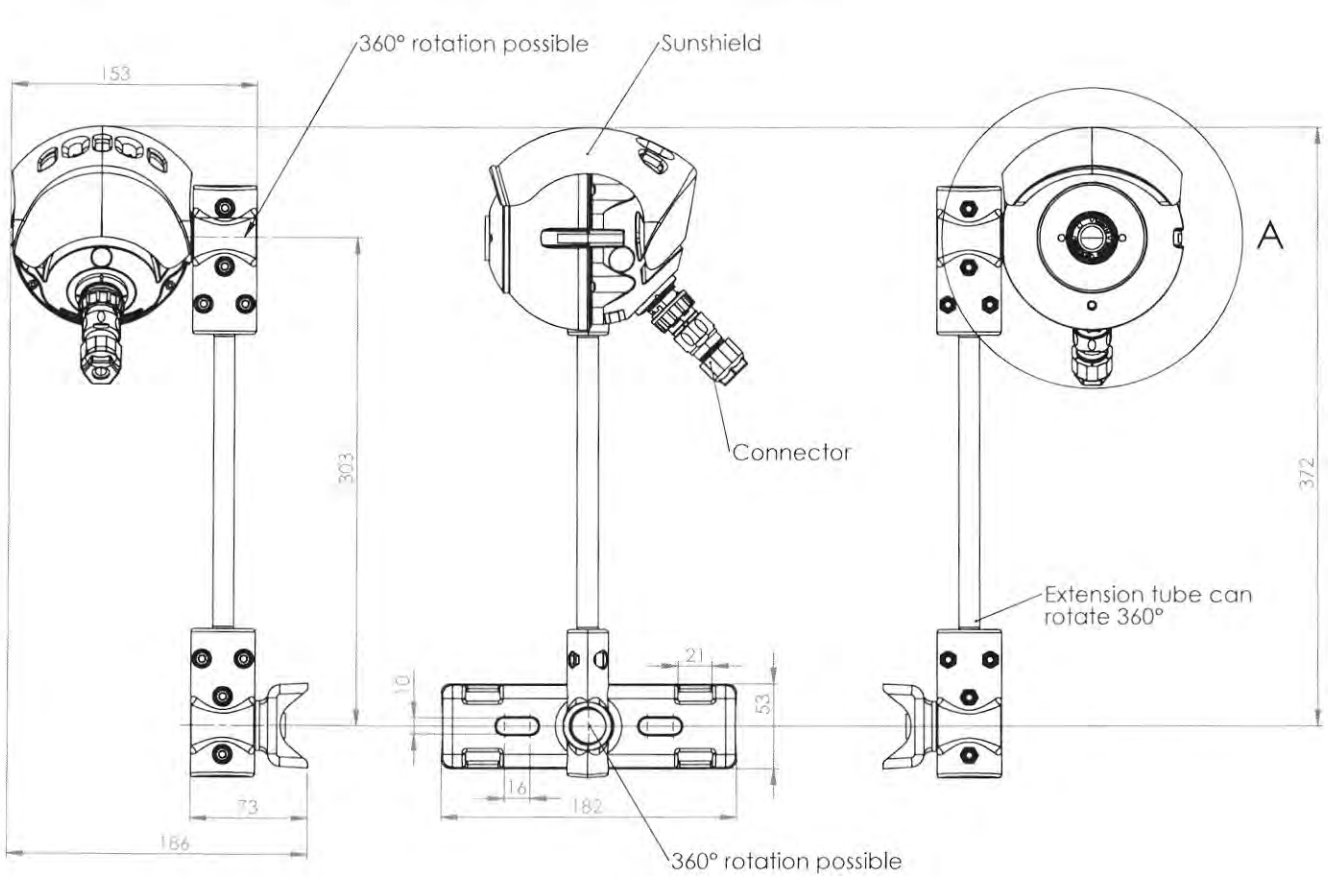
1. Put back all connectors on the backplane of the replacement device.
2. Mount the TI BPL2 EDGE device.
3. Connect TI BPL2 EDGE to the network.

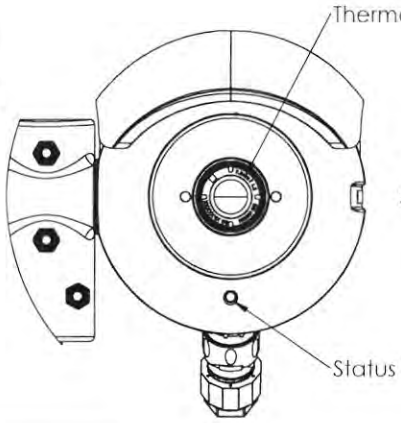
32.6.3 To make the replacement device operational

Assign the IP address of the broken device to the replacement device.

1. Connect the PC to the TrafiSense2 network and open the web interface of the replacement device.
   See 10 *TrafiSense2 web interface*, page 41.
2. If more than one interface is used, go to *Configuration* > *Network* > *BPL* and adapt the *Channel* as necessary.
3. Define the device name.
   11 *General and time settings*, page 42.
4. Assign the error outputs.
   See 9.4 *Error outputs*, page 38.

33 Appendix: TrafiSense2 dimensions





DETAIL A
SCALE 1 : 2

General remark:

- All screws can be fixed with hexagonal key 4
- The bracket can be fixed with cable ties or M8 bolts.

JOT	19/09/2018	02.00	Drawing for customer
Name	Date	Rev.	Description

General Tolerance DIN ISO2768m except where stated

Functional dimensions to check (xxxx) | Dimensions in mm

Linear dimensions								Radii		Angle
From	0,5	3,0	6	30	120	400	Exception:	0,5	3	
To	3,0	6	30	120	400	1000	Punch	Bend	3,0	6	upto 10
Tolerance	±0,1	±0,1	±0,2	±0,3	±0,5	±0,8	±0,15	±0,25	±0,2	±0,5	±1°

General Quality Class: C | Exceptional Quality Class: A

TITLE: ThermiCam2 / TrafiSense2 all configurations

FLIR®

Material: NA

Specifications: NA

Weight in g: Weight camera + bracket: 1220 g

Projection: First angle

DWG NO.: 10-74XX

Revision: A | SCALE 1:3 | SHEET 1 OF 1 | A3

ITS - Hospitalstweg 1B,B-8510 Marke

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