



**APT/ITU Conformance and  
Interoperability Event 2015**  
7 – 8 September 2015, Bangkok, Thailand



---

**Document C&I-3/INP-08**  
**07 September 2015**

Furukawa Electric., Japan

**INTRODUCTION OF OPTICAL FIBER SENSORS**

---

**Contact:**

Furukawa Electric, Japan

**Email:**

**FURUKAWA ELECTRIC** *Bound to Innovate*

---

# Introduction of Optical Fiber Sensor

(Accommodated to ITU-T.G.652/657 fiber spec.)

September 8th 2015  
Furukawa Electric Co. LTD

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

Contents

---

**FURUKAWA ELECTRIC**

<b>1. Introduction of Furukawa Electric.....</b>	<b>3</b>
<b>2. Sensing system Network &amp; Sensor .....</b>	<b>6</b>
<b>3. Optical Cable &amp; Fusion Splicer .....</b>	<b>14</b>
<b>4. Conclusion.....</b>	<b>19</b>

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015 **2**

**FURUKAWA ELECTRIC**

*Bound to Innovate*

# 1. Introduction of Furukawa Electric

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

## Furukawa Electric Corporate Profile FURUKAWA ELECTRIC

**Company name:** Furukawa Electric Co., Ltd.

**Chairman:** Masao Yoshida

**President:** Mitsuyoshi Shibata

**Founded:** 1884

**Established:** 1896

**Paid-in Capital:** ¥69,395 million  
(As of March 31, 2015)

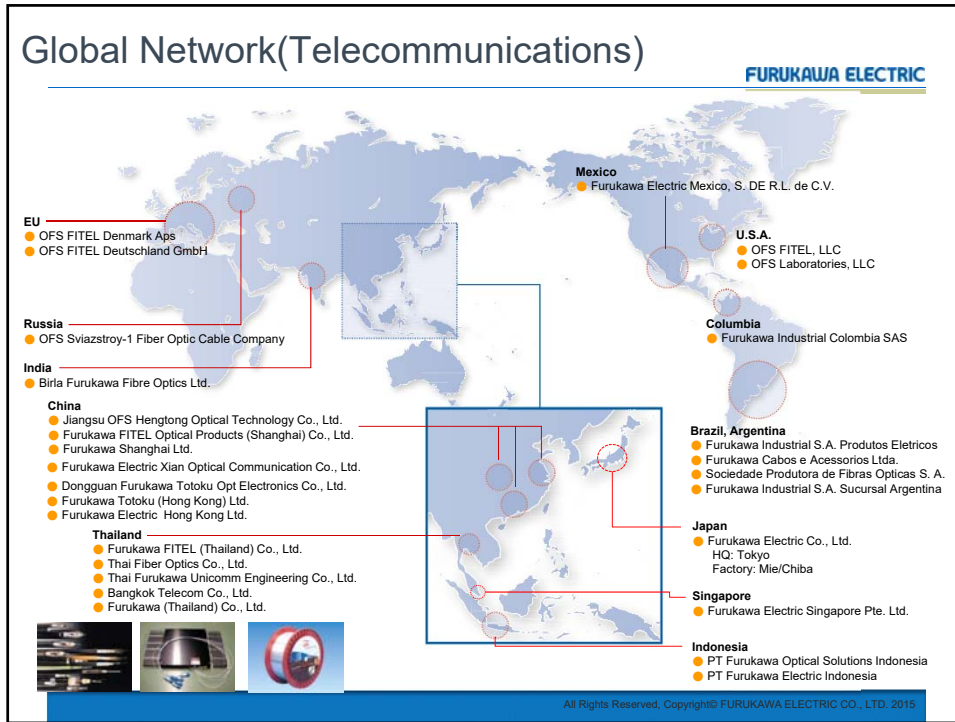
**Net sales:** ¥867,817 million (Consolidated) (Years ended March 31, 2015)

**Employees:** 46,134 (Consolidated)



<div style="background-color: #92d050; padding: 5px; display: inline-block;">Metales <b>14%</b></div>  <p style="font-size: x-small;">Tiras de cobre    Tubos de cobre    Laminas de cobre</p>	<div style="background-color: #ffcc00; padding: 5px; display: inline-block;">Telecomunicaciones <b>16%</b></div>  <p style="font-size: x-small;">Cables de fibra óptica    Dispositivos de fotónica</p>	<div style="background-color: #ff9933; padding: 5px; display: inline-block;">Energía / Productos Industriales <b>31%</b></div>  <p style="font-size: x-small;">Fios de Cobre y Cables de energía    Cintas de plástico para semiconductores</p>	<div style="background-color: #99ccff; padding: 5px; display: inline-block;">Electrónica / Sistemas Automotrices <b>33%</b></div>  <p style="font-size: x-small;">Partes para control de airbags    Espacios en blanco de aluminio para discos duros</p>
<div style="background-color: #0099cc; padding: 5px; display: inline-block;">Servicio y otros <b>6%</b></div>			

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015



**FURUKAWA ELECTRIC** *Bound to Innovate*

## 2. Sensing System Network & Sensor

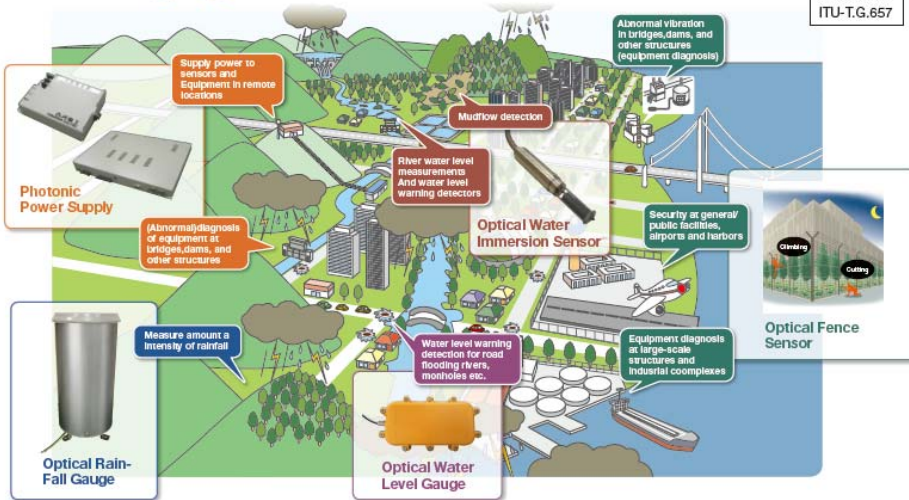
All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD, 2015

## 2. Sensing System Network

FURUKAWA ELECTRIC

### Sensing System

Fiber Spec.  
ITU-T.G.652  
ITU-T.G.657

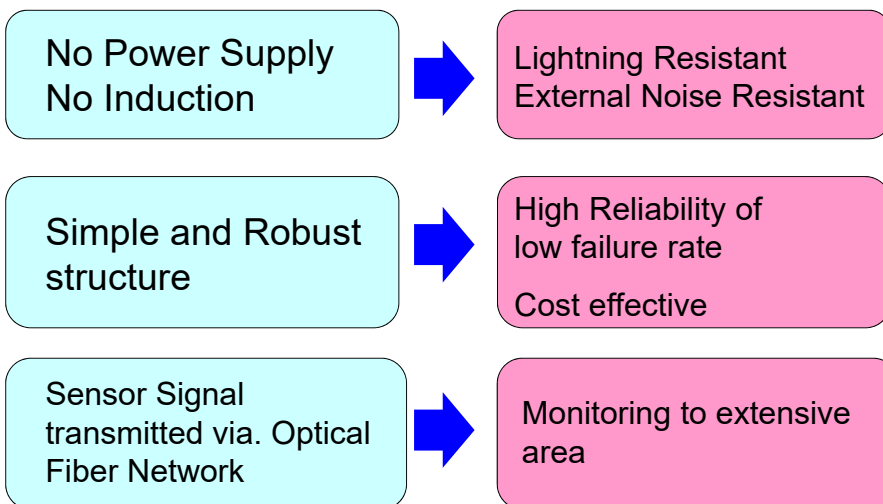


All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

7

### Features of Optical Fiber Sensors

FURUKAWA ELECTRIC



All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

## 2-1 Optical Water Level Gauge

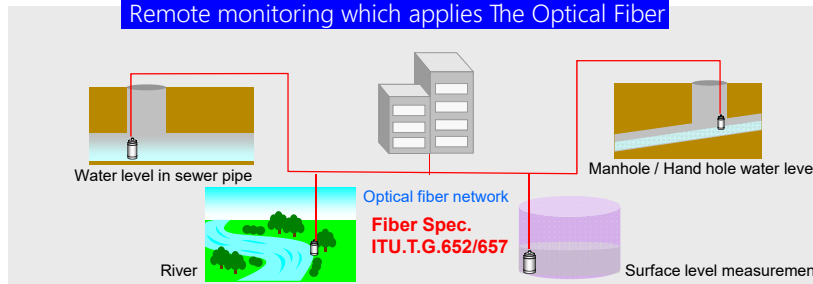
FURUKAWA ELECTRIC



This sensor measures the water level as well as surface of water for sewer pipe, river, manhole and hand-hole.

Sensor itself and transmission line are constructed by optical fiber, which enables to monitor the water-level and surface remotely without the power supply.

### Remote monitoring which applies The Optical Fiber



All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

9

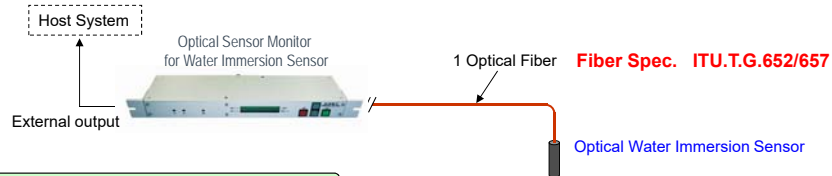
## 2-2 Optical Water Immersion Sensor

FURUKAWA ELECTRIC

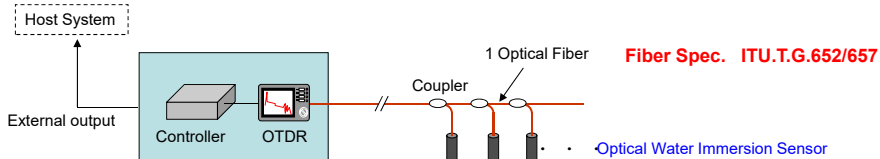


- Detects the surface of water using floating construction.
- Able to detect the flooding status of the road and water-level of the river or manhole remotely. It is also available for water plant, water utilities and the dam.
- Non-power supply with explosion-proof structure enables the installation at harsh environment.

### One-point measurement type (simple configuration)



### Multipoint measurement type (OTDR configuration)

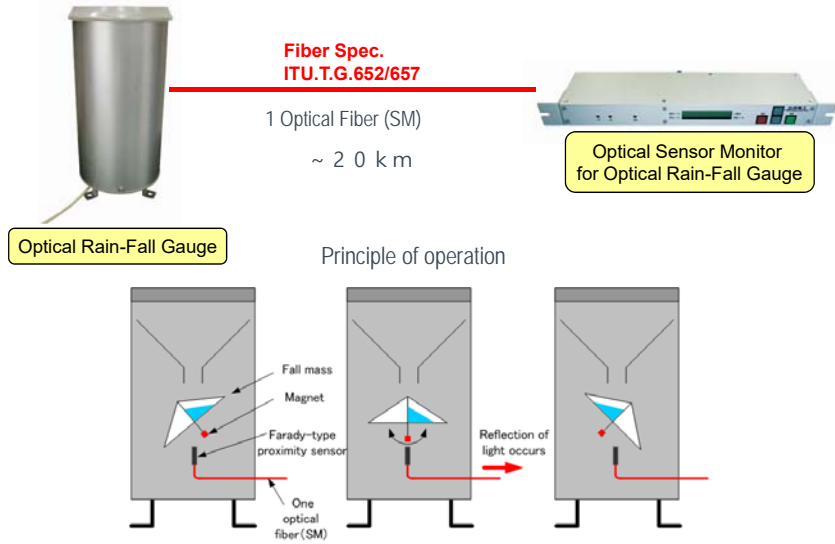


All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

10

## 2-3 Optical Rain-Fall Gauge

FURUKAWA ELECTRIC



All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

11

## 2-4 Photonic Power Supply using Optical Fiber

FURUKAWA ELECTRIC



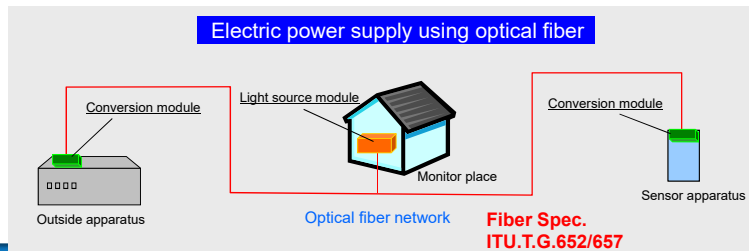
Light source/unit



Conversion/unit

This system supplies the power to the remote place (e.g. sensor and apparatus) using optical fiber.

Reduces the affects from lightning or noise.

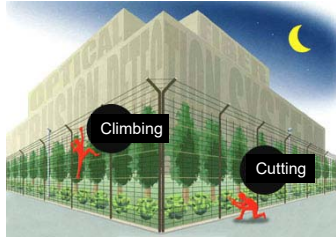


All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

12

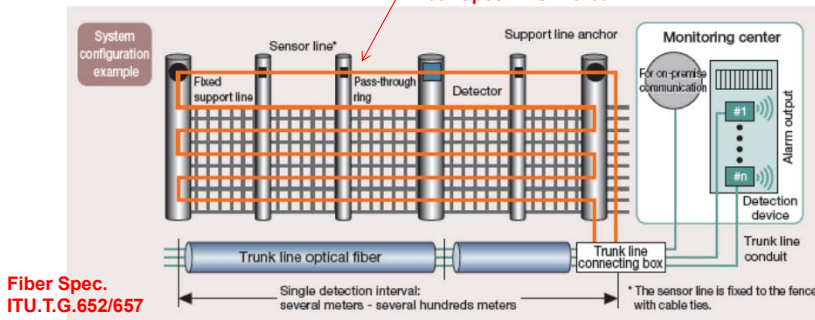
## 2-5 Optical Fence Sensor

FURUKAWA ELECTRIC



Outdoor perimeter security responding to advanced security needs. High-speed detection of intrusion via the fence.

Fiber Spec. ITU.T.G.652



Fiber Spec. ITU.T.G.652/657

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

13

FURUKAWA ELECTRIC

Bound to Innovate

## 3. Optical Cable & Fusion splicer

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015



## Application-Specific Optical Fibers

- covering all application areas

**Long Haul**  
TeraWave  
TrueWave® REACH  
ITU-T.G.654.B  
ITU-T.G.655.C/D

**Regional**  
TrueWave® REACH  
TrueWave® RS/LA  
Metro Express  
TrueWave® RS/LA  
ITU-T.G.655.C/D

**Metro Express**  
TrueWave® RS/LA  
ITU-T.G.655.C/D

**Metro Edge**  
AllWave® \*

**Metro Access**  
AllWave® \*

**Premises**  
AllWave FLEX  
AllWave FLEX +

**FURUKAWA ELECTRIC**

MDU/IHW  
AllWave FLEX Max  
EZ-Bend

ITU-T.G.652.D  
ITU-T.G.657.A1/A2/B3

Access  
AllWave® \*  
AllWave® FLEX  
AllWave® FLEX +

ITU-T.G.652.D  
ITU-T.G.657.A1/A2

\* AllWave® series include AllWave One, AllWave +, AllWave LL, and standard AllWave.

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

15

## Access Area: Optical Cables

**Conventional Single Jacket, Loose Tube Fiber Optic Cable**

**Design / Overview**

A representative cross-section diagram of single sheath cable. A core wrapping tape is applied over the cable core to facilitate bonding ripcord is placed under sheath to ease its removal. A smooth black High-Density Polyethylene sheath is applied over the tape to complete the cable.

Fiber Spec.  
ITU-T.G.652  
ITU-T.G.657

**FURUKAWA ELECTRIC**

**New totally dry, Loose Tube Fiber Optic Cable**

**Design / Overview**

We offers a complete line of totally dry cables. By eliminating messy gels and filling compounds the handling and installation process is greatly streamlined, resulting in higher efficiencies. These cables are available in both loose tube or ribbon structures with dielectric and metallic sheath options.

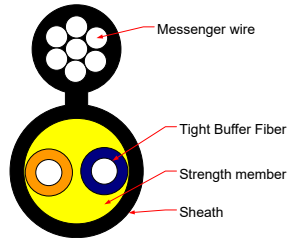
All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

16

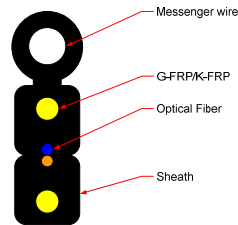
## Application-Optical Drop Cables

FURUKAWA ELECTRIC

### FTTX Round type Cable



### FTTX Flat type Cable



#### Design / Overview

The FTTX cable designed to apply for last link in the optical network which get advantage from small size, light weight, easy strip, flexible, easy bend, well for install excellent crush and tensile resistance, jacket material: LSZH

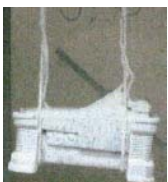
Fiber Spec.  
ITU-T.G.652  
ITU-T.G.657

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

17

## Fusion Splicer S178A

FURUKAWA ELECTRIC



Rugged  
Shock/ Water/ Dust

Compact  
Hand held at 2.3kgs

Fast  
7 sec splice and

Fiber Spec.  
ITU-T.G.652/G.653/G.654/  
G.655/G.657

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

18

**FURUKAWA ELECTRIC** *Bound to Innovate*

---

## 4. Conclusion

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015

**Conclusion** **FURUKAWA ELECTRIC**

---

Optical Sensor

- Effective to prevent disaster
- Accommodated to ITU-T.G fiber 652/657 spec.
- Easy & Fast installation

***Furukawa Electric Group has various optical products.***

All Rights Reserved, Copyright© FURUKAWA ELECTRIC CO., LTD. 2015 20

# Thank you!

