

# Use of PROFIBUS for Cryogenic Instrumentation at XFEL

Torsten A. Böckmann, Jonas Bolte, Yury Bozhko, Matthias Clausen, Kurt Escherich, Olaf Korth, Helge Rickens, Tobias Schnautz, Bernd Schoeneburg and Anatoly Zhirnov

DESY – Hamburg / Germany

The European X-ray Free Electron Laser (XFEL) is a research facility and since December 2016 under commissioning at DESY in Hamburg. The XFEL superconducting accelerator is 1.5 km long and contains 96 superconducting accelerator modules. The control system EPICS (Experimental Physics and Industrial Control System) is used to control and operate the XFEL cryogenic system consisting of the XFEL refrigerator, cryogenic distribution systems and the XFEL accelerator. The PROFIBUS fieldbus technology is the key technology of the cryogenic instrumentation and the link to the control system. More than 650 PROFIBUS nodes are implemented in the different parts of the XFEL cryogenic facilities. The presentation will give an overview of PROFIBUS installation in these facilities regarding engineering, possibilities of diagnostics, commissioning and the first operating experience.

Electronic Rack below the Concrete Shielding

Injector Valve Box XIVB

Linac Valve Box XLVB

Coolbox CB44 with 4 Cold Compressor Stages

Temperature and LHe-Level Modules

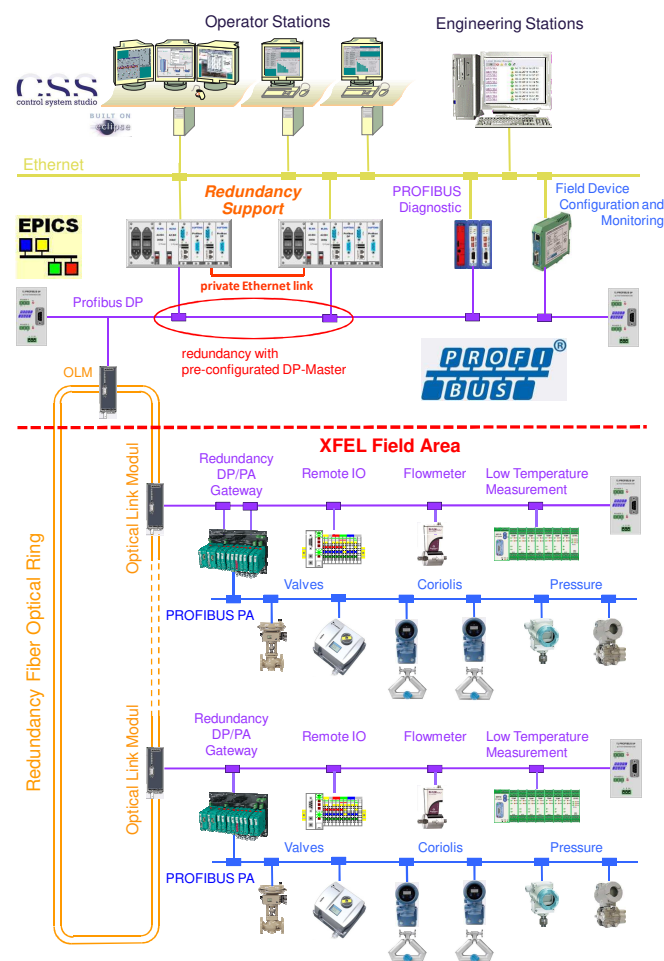
Cryogenic Instrumentation inside of the Electronic Racks

1500m

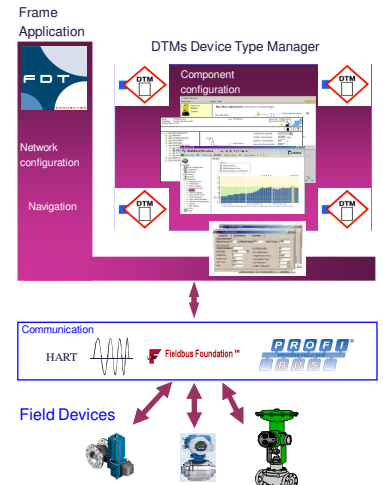
Facility	Number of PROFIBUS Segments DP / PA	Maximum Segment Length	Number of PROFIBUS DP Devices	Number of PROFIBUS PA Devices
Refrigerator KS1	4/5	250m	35	42
Refrigerator KS3	4/5	250m	35	42
Purifier TTR36	2/1	100m	7	29
Distribution Box DB54	2/5	100m	13	53
Coldbox CB 44	2/2	1000m	15	42
Valve Box XLVB	2/4	1000m	12	75
Valve Box XIVB	2/4	1200m	10	35
Injector1 XTINI	2/2	1500m	6	5
LINAC XTL	12/12	2500m	61	113

PROFIBUS FIELD DEVICE	Type	Number
Temperature Sensors	CERNOX	2032
	TVO	536
	PT100/PT1000	414
Control Valves	RHe	72
	Other	268
Pressure Transmitter		130
Flow Transmitter	Coriolis	36
	Gabimetric	9

## XFEL Cryogenic Control and Instrumentation System



## Condition Monitoring



## Condition Monitoring Features

- Automatic Identification of Device Faults
- Diagnostic Logging
- Automatic Uploading and Storage of Device Data
- Clear Display of Online Alerts and Faults
- Instant Identification of Alert Status Location
- Server/Client Functionality of Condition Monitoring
- Quick Report
- Colour-coded Alarms
- TAG Identification by Tool Tip
- Field/Device Reporter

## Field Device Documentation

