ABB MEASUREMENT & ANALYTICS

TALYS ASP400 series

FT-NIR process analyzer – for refinery and petrochemical industries

Measurement made easy

The TALYS ASP400 series is designed to offer a simple base analyzer with a complete range of sampling interfaces suitable for a variety of hydrocarbon and other process streams.

This new generation of analyzer captures over 45 years of expertise in process spectroscopy implementation by ABB in close partnership with our customers.

Contents

Measurement made easy

The TALYS ASP400 series is a single-point fiber optics based industrial FT-NIR analyzer designed for in-line monitoring and control of continuous processes.

Many potential refinery and petrochemical plant analytical applications require a relatively simple, robust and low-cost analyzer implementation, whilst retaining the important features of high quality analytical performance, hazardous area installation capability and full communications and I/O facilities for sample system control and DCS communications. The TALYS ASP400 series fiber-optic process FT-NIR analyzerfully meet these needs while offering in addition extremely low maintenance costs and simplified installation and utility requirements.

TALYS was designed around the following key concepts:

- Ease of implementation
- Ease of use
- State-of-the-art analytical performance
- Industrial robustness
- Minimal maintenance requirement

Applicable in general to most refinery hydrocarbon streams including:

- Naphtha conversion units – CCR, HDT, HDS, and ISOM
- Final product blending – gasoline & diesel
- Naphtha steam cracking – olefins unit
- HF alkylation – HF, iC4, olefins
- LPG c3 to c5+

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01 Refinery plant where TALYS ASP400 can improve and maximize productivity.

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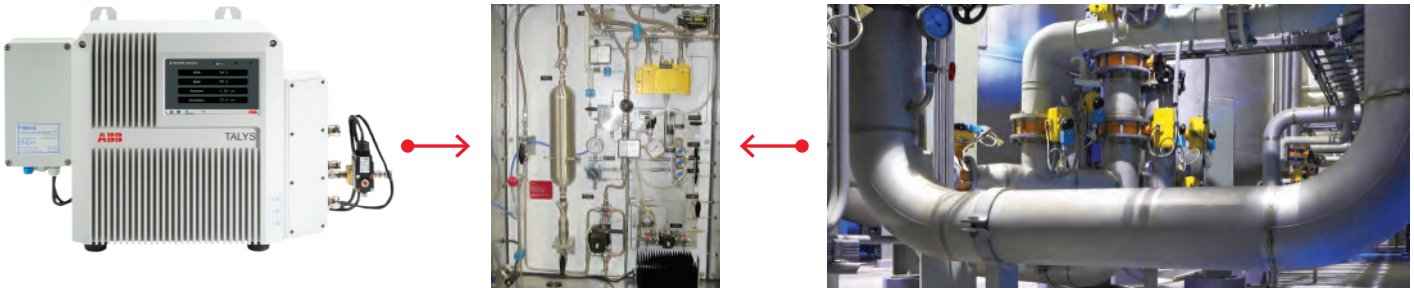
A simple and versatile tool for refinery process optimization



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TALYS ASP400 allows determination of stream qualities or physical properties, process characterization and early troubleshooting.

Its seamless installation enables real-time process monitoring, determination of stream properties or physical qualities, process characterization and early troubleshooting.

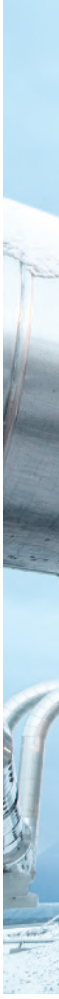
TALYS uses all of the new FT-NIR analyzer features introduced with ABB's latest series of products, including the VECSL solid-state laser, 24bit ADC conversion, active power-management of the NIR source, all leading to a service interval of > 5 years or more.

TALYS possesses an innovative feature for FT-NIR based analyzers with an on-board embedded controller complete with HMI display. This significantly reduces packaging, space, power and other utility requirements. The TALYS system can be accessed remotely by PC over Ethernet for full diagnostics.

Features
- Small footprint
- Fully integrated in single enclosure
- Unit may be either shelf or wall mounted
- No analyzer PC required
- ExP purge controller integrated with base enclosure (optional)
- Low cost of ownership with virtually no scheduled maintenance for 5 years
- On-board HMI display and embedded controller
- Full connectivity to DCS: Modbus TCP/IP, RTU and OPC
- Hardwired I/O and pneumatics for sample system control in ExD enclosure with ABB PLC module

Benefits
- Simple installation with very limited footprint in analyzer shelter
- Possible to field-mount in weather-protection cabinet or enclosure
- Multiple properties are estimated simultaneously, and calibration model sets for different process stream grades or types may be implemented
- Minimal field maintenance requirement
- Flexible sampling – the TALYS ASP400 series is suitable for use with insertion / extraction transmission or transflectance probes, flow-through fast-loop sample cells, or full-specification extractive sampling system with automatic wash.

Uncompromized analytical performance



State-of-the art interferometer design
The core of TALYS ASP400 series technology is the latest generation of double-pivot compact interferometer developed by ABB.

Innovative features related to interferometer design and signal sampling ensure exceptional analytical performance, stability and robustness of the analyzer:

- Patented scan mechanism
- Integrated modular compact design including source module and output collimator with Jacquinot stop
- Unique patented 24-bit sampling algorithm for optimal dynamic range

TALYS interferometer design is the same as used in ABB's latest generation of laboratory FT-NIR analyzers (MB3600 series). This common design, combined with the very strict manufacturing tolerances and high reproducibility of ABB analyzers ensures a smooth transfer of calibration between sites and instruments with limitation that the sampling and detectors are similar to allow for:

- Seamless transfer between ABB laboratory and process analyzers with similar sampling conditions
- Seamless transfer between ABB process analyzers

In addition, TALYS supports a variety of detectors to ensure optimal analytical performance (sensitivity and spectral range) tailored to application needs.

Refinery & petrochemical unit applications
Naphtha conversion complex
TALYS is particularly well suited for refinery applications in the Naphtha conversion complex. This area of the refinery is involved in the upgrading of straight-run Naphtha by hydrotreating (HDT), catalytic reforming (CCR) and isomerization (ISOM) units. The primary control objectives are to maximise unit throughput, maintain product quality, and to avoid excessive furnace severity leading to catalyst degradation and furnace tube coking. To achieve this real-time feed and/or rundown analysis is essential. Example applications would include heavy Naphtha feed to the CCR, light Naphtha feed to the ISOM and both isomerate and reformate unit product rundown streams.

In addition another important petrochemical unit (the Naphtha steam cracker/olefins unit) is highly dependent on its Naphtha feed quality for optimized control and operation.

Naphtha feed streams can in principle be measured on-line by GC techniques, but the qualities required for effective control include PIONA and T90/T95, which require long elution times. FT-NIR offers much faster and more repeatable analysis compared to GC on-line analyzers with ability to measure other key physical properties.

The benefits and source of return-on-investment (ROI) for on-line measurement in a refinery linked with Naphtha conversion complex can be summarized as:

- Tight furnace control
- Improved reformate RON and benzene / aromatics quality
- More flexible response to Naphtha feed transitions
- Extended catalyst run-lengths

The TALYS ASP400 series will provide real-time process information for the following key needs:

- Monitor Naphtha feed to CCR, ISOM and NSC units to enable rapid response to feed quality transitions
- Control furnace / catalyst severity for optimum octane, BTX and run-length

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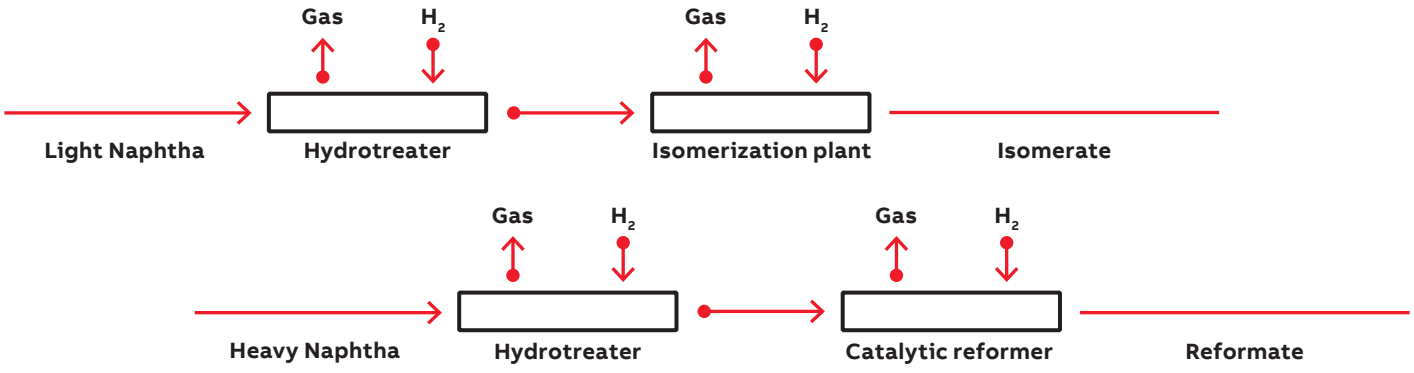
Refinery operations

Light and heavy Naphtha conversion



Applicable to different Naphtha complex processes

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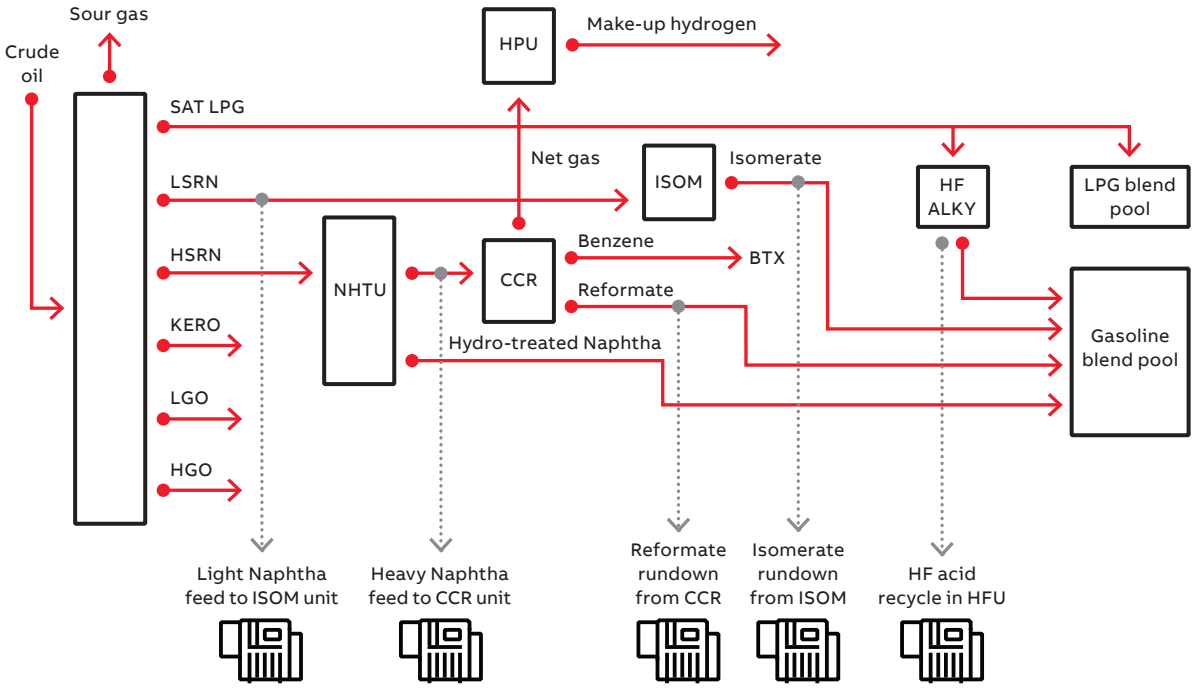
Schematic showing where TALYS ASP400 series is applicable to different Naphtha complex processes in the conversion process.



Process	Measurement Need	Example of measured products
CCR – catalytic reforming unit	Improve CCR operation and flexibility, maximise reformate octane barrels, and lengthen catalyst run-times by better severity control	Heavy Naphtha feed • PIONA, T95, RVP Reformate product rundown • RON, benzene, aromatics, RVP
ISOM – Naphtha isomerisation unit	Improve ISOM unit operation and flexibility, maximise isomerate yield and quality, for better supply of gasoline blending feedstock Rapid detection of Naphtha feed quality changes due to CDU swop-over and cut-point variation	Light Naphtha feed • PIONA, T95, RVP Isomerate product rundown • RON, RVP
Naphtha steam cracker – olefins unit	Maintain stable furnace operation and optimum olefins yield by using real-time Naphtha feed quality data in the on-line optimizer. Reduce furnace coking and downstream compressor flooding.	Raw Naphtha feed • PIONA, T90, T95 Optional: custom modelling for C-number
HDT – Naphtha hydrotreating unit	Monitor and control effective operation of Naphtha hydrotreating unit	Heavy Naphtha feed: • PIONA, T90, T95 Hydrotreated Naphtha product: • PIONA, T90, T95 Limited number of specific components (Cn)
Gasoline blending	Optimization of gasoline blending operation to meet product quality targets and avoid re-blends	RON, MON, aromatics, benzene, olefins, oxygenates, E70, E100, E150, RVP
HF alkylation	Monitor HF acid catalyst purity to minimize unit corrosion, avoid acid runaway and maximise alkylate octane barrels	HF%, ASO% and water%
LPG – various units	Monitor and control effective operation of depropanizer, debutanizer units	Typically c3%-c5+%

Additional applications and sample conditioning systems for TALYS ASP400 series process FT-NIR analyzers

HF alkylation unit and HF acid recycle
The TALYS single-point FT-NIR analyzer is ideally suited to the monitoring of HF acid catalyst purity in a refinery HF alkylation unit. The analyzer in this case is normally placed in a remote, safe area location outside of the protected HF acid area. TALYS is easy to install, requiring very limited space and utilities. An Ex-certified version is also available if required. This system makes use of ABB's extensive experience in HF acid recycle purity monitoring and employs the standard field-proven HF Acid field sample system, but at overall lower project cost.

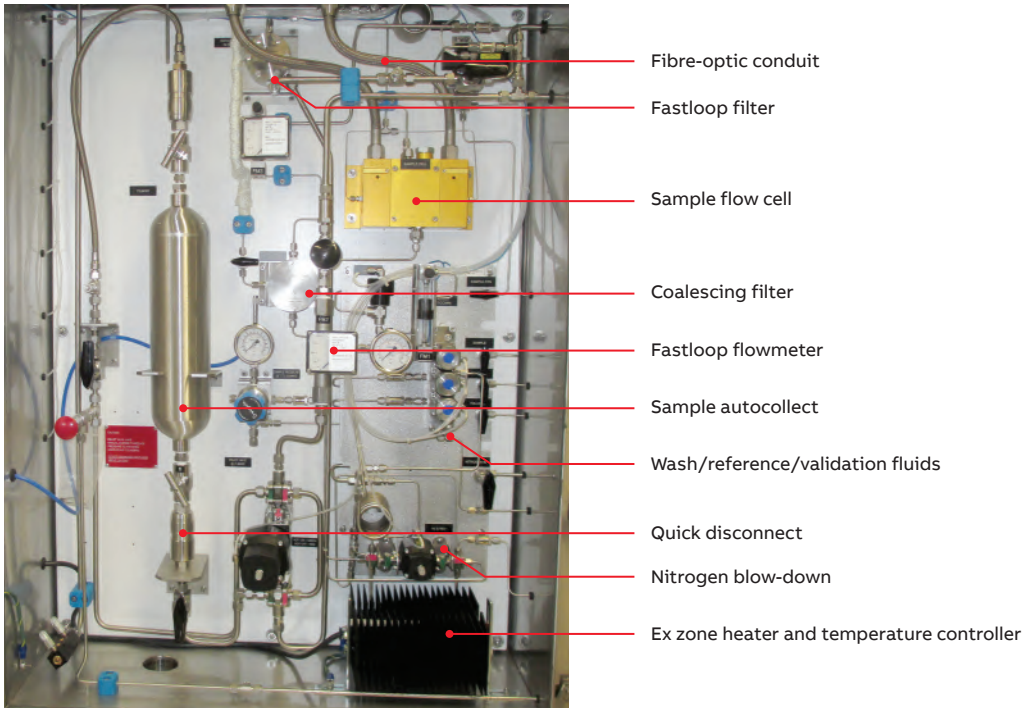
LPG streams
TALYS ASP400 can also be applied to monitoring of liquid petroleum gas streams for rapid online characterization of light hydrocarbon stream composition.

Gasoline blending
Gasoline and diesel production is intensely optimized and monitored as the delivered product qualities are regulated by legislation. Blending components in the final processing step feed to the gasoline and diesel blend headers. The primary objective and source of ROI will be related to product throughput, reduction in re-blend work and minimizing product giveaway.

TALYS ASP400 series can also be used for gasoline and diesel blending within the refinery operations. ABB offers the FTPA2000-HP460 product for dedicated extractive measurement with very high performance for critical on-line blend optimization applications. It offers the TALYS ASP400 series as an alternate blending analyzer platform that may be used with fiber optics for a simplified installation at a generally lower cost and performance where only a single-stream analysis is required.

TALYS ASP400 series sampling interface package solutions
The TALYS ASP400 series of FT-NIR analyzer solutions is designed to offer a simple base analyzer with a complete range of flexible sampling interface options suitable for use in a refinery location with the typical requirements for hazardous zone placement of both analyzer and sample handling. TALYS uses fiber optics to transfer Near-IR light to/from the sample where measured. The sample is normally either extracted from the process stream in a fast loop and brought to a temperature stabilized sample cell or else an in situ probe may be employed. Sample extraction is the preferred approach to allow control of conditions and ensure the highest measurement repeatability and robustness.

Example integrated sample fast-loop conditioning system with flow cell and automatic wash, reference and sample auto-grab is shown here.



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01 Sample conditioning system including fast-loop, flow cell and automatic wash.
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02 Extraction of sample to the sample cell for measurement by FT-NIR.

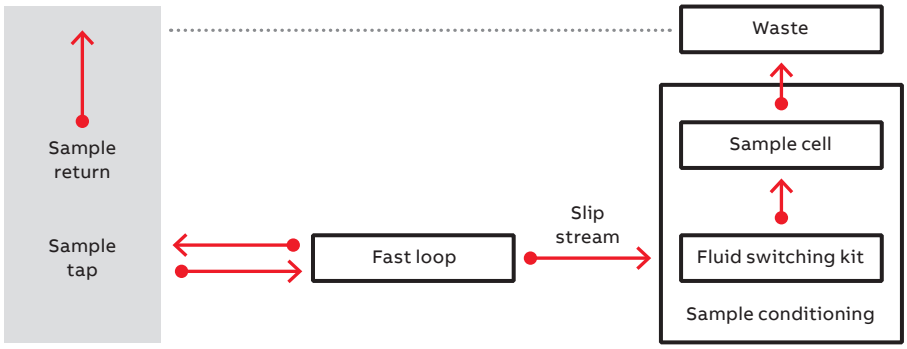
The most common way to extract a sample from a given sample stream is to define a sample handling system with a fast loop to allow circulation of the sample and take a smaller sample amount via a 'slip stream' to send to the sample cell which may be conditioned.

There are three sample interface package solutions offered for the TALYS ASP400 and ASP400-Ex series.

- A basic high-flow rate sample transmission cell located directly in a fast loop panel
- A sample flow cell in the slip-stream from a fast loop sample conditioning filter with cabinet & temperature control, but manual valve operation for cell wash and reference
- A full-specification sample flow-cell system with sample conditioning as above but also fully automatic valve operation for sample shut-off and wash/reference/validation.

Sampling options are also available

- Coalescing filter to limit water content in the sample (available for the auto and manual packages only)
- Auto grab module for automatic capture of a process sample for laboratory standard test method (available for the auto package only)



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TALYS ASP400-Ex analyzer specifications for hazardous classified area

TALYS ASP400 is offered in two configurations. One is the ASP400 base analyzer unit designated for safe area location and the other is the ASP400-Ex unit which may be placed directly in hazardous classified areas as zone 1 (category 2) or Class 1 Div 1.

Includes
- FT-NIR process spectrometer covering the 14,000 to 3,800 cm^{-1} range (BK7 optics) with one channel fiber optics input/output
- InGaAs 2.1 micron room-temperature detector
- Ethernet interface for connection with control systems or external PC
- Embedded process control software
- Default software configuration for 10 chemistries (10 properties per chemistry) [a limitation will apply dependent to model sizes]
- Closed loop fiber for verification
- TALYS USB key
- Touch screen display (7 in)
- ASP400-Ex model includes integration of additional material for Ex area classification; APU, purge box, fast purge

Optional
- Flameproof box for hazardous area (or available as general purpose mounting on plate) with power supply, I/O components and Modbus TCP/IP to RS485 converter (available optionally or included with AUTO sample system)

Note
- Installation sold separately
- Sampling accessory and fiber optics sold separately
- Requires N2 or dry instrument air (–40˚C dew point)

Specifications
- Dimensions (H x W x D): 36.9 x 35 x 25.5 cm (14.5 x 13.7 x 10 in)
- Weight: 20 kg (primary TALYS analyzer enclosure excluding APU and side purge box)
- Mounting: wall or shelf mounting
- Detectors available:
  - InGaAs 2.1: 4,550 to 10,500 cm^{-1}
  - InGaAs 2.1 TE-cooled: 4,750 to 10,500 cm^{-1}
  - InGaAs 2.6: 4,000 to 10,000 cm^{-1}
- Source: quartz halogen with electronic stabilization
- Metrology: solid state laser
- Apodized spectral resolution adjustable from 1 cm^{-1} to 64 cm^{-1}
- Wavenumber repeatability (@7,300cm^{-1}): < 0.006 cm^{-1}
- Wavenumber accuracy (@7,300cm^{-1}): < 0.06 cm^{-1}

Communications
- ModBus TCP/IP Ethernet, (serial RS232/RS485 via converter)
- OPC DA (Ethernet)
- PLC interface for I/Os
  - Hardwired analog and digital I/O via PLC in separate Ex d enclosure
- Packages supported for chemometrics models:
  - Horizon MB Quantify
  - PLSPlus
  - PLSIQ
  - Unscrambler (version 9.8 supported)
  - Pirouette (via PLSPlus exported *.cal file)
- Fiber optics connectors: SMA 905
- Electrical: <100 W consumption in routine operation

Environmental
- Operating temperature: 5˚C to 35˚C
- Operating relative humidity: <95% non-condensing
- Purgeable
- Enclosure: IP54 suitable

Hazardous area certification (applies to TALYS ASP400-Ex model)
- ATEX / IECEx / EAC: II 2(1) G Ex e [ib] mb [op is Ga] px IIC T4 Gb
- CSA: Class 1, Division 1, Groups B, C, D, T4

Certifications
- cTUVus
- CE
- CB Scheme (IEC)
- FCC
- Laser safety FDA/IEC/EN 60825-1
- RoHS
- WEEE

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