HDT®

Motors & Digital Drives

EtherCAT

PROFINET

CANopen

Modbus

EtherNet/IP

1969/2019
50
YEARS
IN THE ELECTRONIC
WORLD

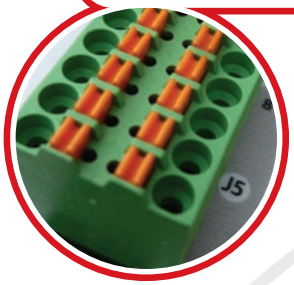
NTT

Digital servodrive solutions

The spirit of motion control.

Developed for modern automation needs, the NTT servodrive is designed around a new CPU that allows great performances and the real-time connectivity via fieldbus like EtherCat, ProfiNet, Ethernet/IP, CanOpen and Modbus. The NTT drives distinguish theselves thanks to the great flexibility in motor control, whether they are AC or DC, synchronous or asynchronous, rotary or linear with feedback from Resolver or incremental or absolute encoders up to 32 bit on the single-turn and 16 bit on the multiturn.
The many features of these drives offer a solution for most applications, whether they are speed control, torque, but also positioning, electronic gear, electronic shaft and pressure control for servopumps and servocylinders.

Terminals easy to wire



230VAC
UP TO 3 kW

Keypad
- *Keypad with 5 Digit display*

Control Mode
- *FieldBus*
- *Pulses/Direction*
- *16 bit Analog reference*

Encoder Output Line Drive 5V[1]
- *Main Feedback Repetition.*
- *Pulses/Direction Repetition.*
- *Simulated encoder, up to 16384 ppr + Zero Index*

Software Applications
- *Speed control*
- *Sensorless speed control*
- *Torque control and torque limit*
- *Multi-positioner*
- *Electronic gear*
- *Electronic cam*
- *Servo-pump control*
- *Servo-cylinder control*

Software Filters
- *Notch filter*
- *Iq filter*
- *Digital Input FIlter*
- *Observer*
- *Measured Speed Filter*

Protection Circuits
- *Motor short-circuit*
- *Over/undervoltage of power supply*
- *Drive Overtemperature*
- *Feedback fault*
- *Rated Current limit*
- *Motor temperature thermal image*
- *Other protections*

Brake
- *Electronic brake management*

Main Features

Integrated safety STO
Input for safety stop STO, SIL3, Cat.0, according to IEC61800-5-2:2007

Communication Ports
- *Micro USB 2.0*
- *RJ45 Ethernet port*
- *RS485 for proprietary fieldbus[2]*

Ethernet Port
- *for Industry 4.0*
- *for remote control via router*
- *for diagnostic*

400VAC
UP TO 120kW

Optional Fieldbuses
- *EtherCat CoE*
- *ProfiNet RT and IRT[3]*
- *CanOpen CiA 402*
- *ModBus RTU*
- *Ethernet IP*

Main Feedback
- *Sensorless*
- *Hall's sensors*
- *Incremental Encoder 5V LD*
- *Inc. Enc. with Hall's sensors*
- *Absolute Encoder SSI(Bin), BiSS (B/C), EnDat2.2*

Optional Feedback
- *Resolver*
- *Absolute Encoder SSI(Bin), BiSS(B-C), EnDat(2.1-2.2) + SinCos*
- *Absolute Encoder HiperFace + SinCos*

Auxiliary Encoder
- *Incremental Encoder 5V LD/24V LD*
- *Absolute Encoder SSI(Bin), BiSS (B/C), EnDat2.2*
- *SinCos (option)*
- *Hiperface (option)*

Analog I/O
- *3 Inputs:*
  - *1 x 16bit input*
  - *2 x 12Bit inputs*
- *2 programmable outputs*

Digital I/O
- *8 PNP programmable optoinsulated inputs*
- *3 PNP programmable non optoinsulated inputs*
- *6 PNP programmable optoinsulated outputs*
- *1 programmable clean contact relay*
- *1 frequency input*

Controllable Motors
- *AC brushless servomotor (Synchronous):*
  - *rotary type*
  - *linear type*
- *Induction AC servomotor (Asynchronous)*
  - *V/Hz control*
  - *FOC control (sensorless or with encoder)*
- *DC permanent magnet motor*

1=24V Optional 2= Under development 3= Certified

Sizes in current and overall dimensions

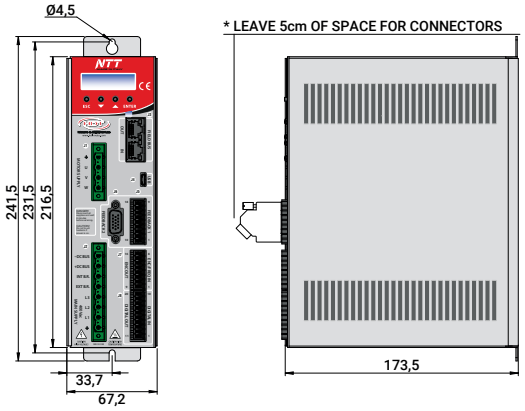
NTT240

SIZES		1.5	3	6	10
Power supply	V_{AC}	230 V_{AC} 1Ph - 3Ph			230 V_{AC} 3Ph
Min/Max supply voltage	V_{AC}	230V_{AC} ±15% - 50/60Hz			
DC Min/Max supply voltage	V_{DC}	200 V_{DC} ÷360 V_{DC}			
Rated current	A_{rms}	1,5	3	6	10
Peak current	A_{rms}	3	6	12	20
Rated output power	KW	0,5	1	1,5	3
Internal braking resistor		NO	NO	YES	YES
External optional braking resistor output		YES			
EMC internal filter *		YES			
Logic supply	V_{DC}	24V_{DC} ± 20%			
Dynamic forced ventilation		NO			YES
Dimensions		T0		T1	T2
Weight	Kg	2		2,4	2,6
Safety functions		STO - Safe Torque Off: IEC61800-5-2:2007 SIL3 Cat.0: EN61508:2001 (EN954-1:1996)			

* = (EMC 61800-3 cat. C2 - C3)

Dimensions

TØ



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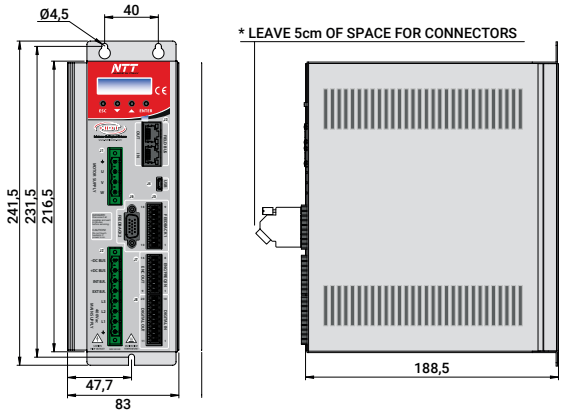

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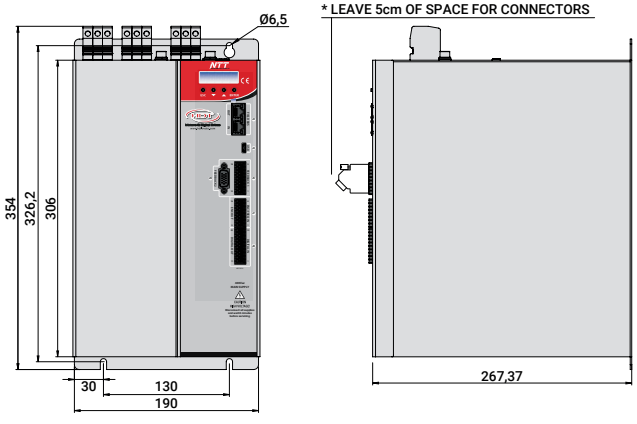

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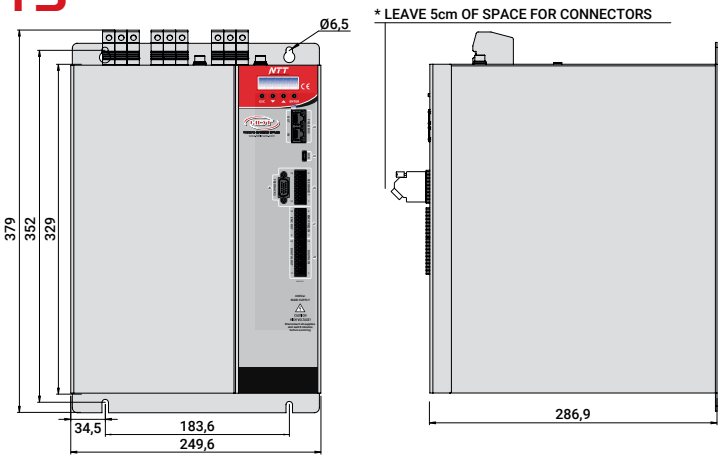


Measures in millimeters

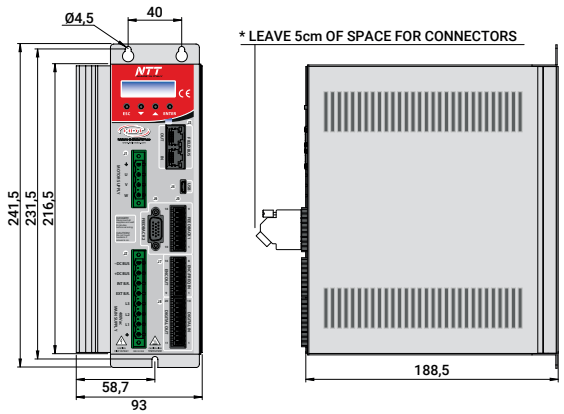
Sizes in current and overall dimensions

NTT460

SIZES		1.5	3	6	10	20	35	45		75	100	150	200
Power supply	V_{AC}	400V_{AC} 3Ph											
Min/Max supply voltage	V_{AC}	400V_{AC} ±15% - 50/60Hz											
DC Min/Max supply voltage	V_{DC}	400 V_{DC} ÷ 700 V_{DC}											
Rated current	A_{rms}	1,5	3	6	10	20	35	45		75	100	150	200
Peak current	A_{rms}	3	6	12	20	40	70	90	150	150	250	375	500
Rated output power	KW	0,9	1,5	3	5	10	17	22		40	60	90	120
Internal braking resistor		NO	YES			NO							
External optional braking resistor output		YES											
EMC internal filter*		YES			EXTERNAL								
Logic supply	V_{DC}	24V_{DC} ± 20%											
Dynamic forced ventilation		NO		YES									
Dimensions		T0	T1	T2	T3		T4			T5	T6		T7
Weight	Kg	1,8	2,4	2,6	5,5	5,5	12	12	14	20	26,2	27,8	34
Safety functions		STO - Safe Torque Off: IEC61800-5-2:2007 - SIL3 Cat.0: EN61508:2001 (EN954-1:1996)											

* = (EMC 61800-3 cat.C3)

T2



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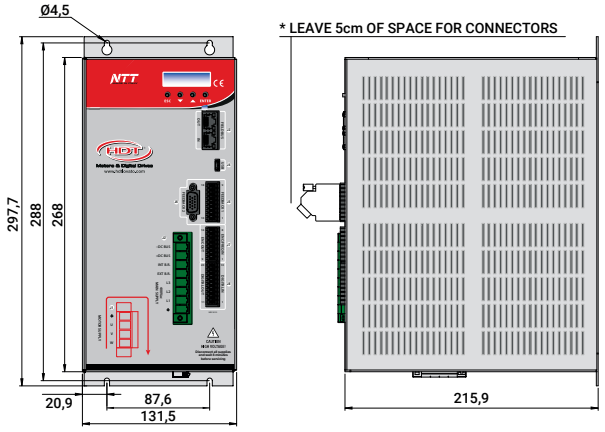

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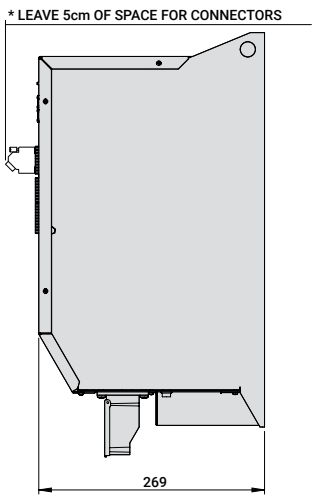

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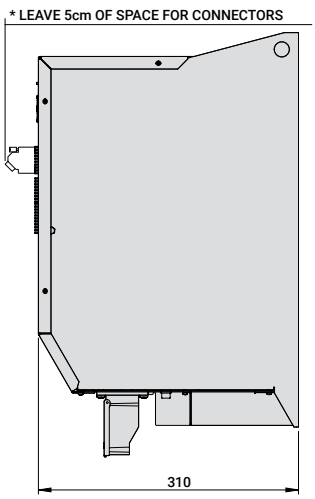
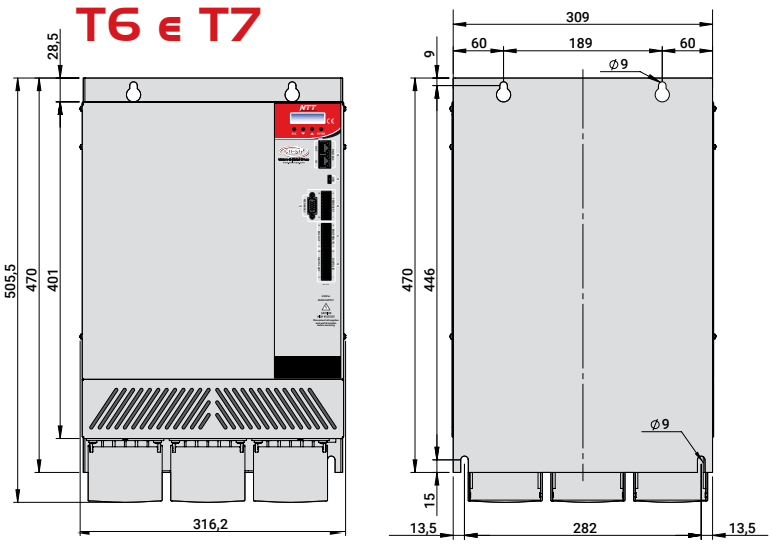


T6 e T7



Servodrive technical specifications

Technical specification of NTT Servodrive			
Control method	Digital regulation loop for torque, speed and position	for AC brushless synchronous motor, rotary and linear: FOC control, SVM modulation, with feedback or sensorless.	
		for rotary asynchronous motor: V/Hz and FOC control, SVM modulation with feedback or sensorless.	
		for DC synchronous rotary brushless motor: trapezoidal modulation when using a feedback only from Hall sensors.	
		for permanent magnet continous current motor (rotary) : only with incremental encoder feedback.	
Main feedback	Hall's sensors	120° sequence.	
	Encoder	Incremental 5V Line Driver with/without Hall sensors (adjustable power supply form 5 to 9V) 32bit Absolute SSI(Bin), BiSS(B-C), EnDat(2.1-2.2). (adjustable power supply form 5 to 9V)	
	Sensorless	Sensorless FOC and V/Hz	
Second optional feedback	Resolver	16 Bit with simulated encoder 5V Line Drives - (24V option)	
	Encoder	Hyperface + Sincos[2] 32bit Abs. Enc. SSI, BiSS, EnDat + SinCos[2]	
Main analog reference		±10V differential speed and torque 16Bit	
Auxiliary analog reference		±10V differential speed, torque and position 12Bit	
Frequency reference	Speed and position	Pulses and direction (2MHz) Incremental encoder A/B (2MHz) CW/CCW (2MHz)	
Encoder output	Simulated encoder	for resolver feedback: possibility to select 256, 1024, 4069 or 16384ppr - 5V Line Drive (24V LD option)	
	Repetition	ABZ channels repetition of the main feedback Frequency reference repetition	
Control mode	Speed	Speed with/without torque limit. Adjustable trapezoidal or "S" ramps.	
	Torque	Torque control	
	Position	Multi-positioner: single target, from cyclic/acyclic table, analog Electronic gearbox: references from CW-CCW, A/B channels and puse/direction Electronic cam: referecnes from CW-CCW and A/B channels	
	Pressure	Pressure control, servo-pump control, servo-cylinder control	
	Servo-pump	Control for servo-pump flux and pressure regulation	
	Servo-cylinder	Control for regulation of position and force of idraulic servo-cylinder	
	Winder	Control for winder, unwinder, yarn guide, tension group	
Fieldbuses	Option	**CM** - Modbus RTU - CanOpen CiA 402 **EC** - EtherCat CoE (CiA 402)	**PN** - ProfiNet RT e IRT (CC - C) - EtherNet/IP (CIP)
Configurable inputs and outputs	Input	8 digital inputs PNP (2 Touch Probe) 3 analog inputs	
	Output	6 digital outputs PNP 2 analog outputs 1 relay contact output	
Digital filters		Observer on motor feedback. Notch filter on current reference. Iq filter on motor quadrature current.	Low-pass filter on igital and analog inputs. Low-pass filter on measured speed.
Drive and motor protection function		Shortcircuit Over/Undervoltage Missing phase and AC power supply I/O Power Failure Motor thermal image PTC management	Overtemperature of the heatsink (dynamic management of ventilation) Thermal image of braking resistor. Resolver or Encoder/Hall's sensor breakdown Current limit
Drive interface		5 digits display and keys for displaying and managing the status of the drive and part of its parameters	
Hardware Safety function		STO - Safe Torque Off: IEC61800-5 - SIL3 Cat.0: EN61508	
Software Safety functions		Fault Reaction and Emergency Stop modes: Inertia Stop - Ramp Stop - Torque Limit Stop Braking in torque limit in case of a limit switch.	
Braking management		Integrated brake management with immediate or ramp stop DC braking for asynchronous motors*	
Drive parametrization		Via CALIPER 4.0 software through the microUSB port	
Additional features		Motor autophasing procedure available for every type of feedback. Cogging compensation for brushless motors.	

1= under development 2=Sincos channels and Hiperface available only with Resolver option.

Position transducers

The NTT servodrive is equipped with several inputs for the reading of position transducers. A standard main input that allows to read incremental and absolute encoders. A second input dedicated to the reading of a second external incremental encoder or for a frequency-direction signal from PLC. A third optional input that can be chosen between Resolver or other absolute Sincos encoders and to use both for motor control and for the acquisition of the signal of an external feedback placed on the application.
The transducers mounted on the motor gives to the servodrive the information to control exactly the motion of the motor. The NTT drive can control both rotary and linear motors and therefore capable to read both transducers for rotary and linear motors of various types.
The NTT drive also allows to control sensorless rotary motors, but this use is limited to "motion control" applications that don't need accurate positioning. Most of "motion control" applications need an accurate control of the axis, and therefore they rely on position transducers with high precision, repeatability and robustness characteristics.

Resolver

The NTT drive allows as an option to read a feedback from a resolver. The resolver is a electromechanical device used in rotary application to detect the speed, the direction and the position of a rotary shaft. Rotating together with the shaft, it develops a sinusoidal signal that is detected and converted in digital from the NTT servodrive granting a precision of 16 bits.
NTT can generate the signal of an emulated incremental encoder with selectable resolutions of 256, 1024, 4096 and 16348ppr.
The resolver for its physical structure is certainly the most suitable transducer for heavy work environments and this makes it on of the favorite solutions.

Incremental encoder with Hall sensors

The NTT servodrive in his standard configuration allows reading Incremental Encoders with or without Hall sensors. The Incremental Encoder is an optoelectronic device applied to the motor's rotor that develops square-wave signals proportional to the angular shift of its rotary axis that is given back to the drive to manage both the motor and the application. The encoder provides an information of relative position, not absolute, and therefore is always necessary an "homing" procedure to define an absolute position of the system. The signal generated is sent to the drive that performs the count and extrapolates, according to frequency, space, speed and acceleration data needed to control the motor. The resolution depends on the sensor and is measured in PPR, that is "pulses per round". Usually, HDT motors use incremental encoders with 2500ppr.

Absolute encoder SSI - BiSS - EnDat - Hiperface² - SinCos²

The absolute encoder is designed to provide an information of absolute position on the single turn or on the multi-turn; mechanically, the working principle is similar to an incremental encoder, which have a univocal code written on a disk that allows to identify every angular position of the axis. Therefore it is always possible to know exactly the position of the axis even when stationary, without the necessity to perform an "homing" procedure to define the absolute position. The digital signal sent to the drive or to CNC is a serial protocol. SSI, BiSS, EnDat (2.1-2.2) and Hiperface are the four serial protocols handled by NTT servodrives with Sincos channels if resolver option is installed with a resolution of 32bit on single turn and 16bit on multiturn.
The encoder for a multi-turns information can usa a mechanical system (more reliable but expensive) or it can memorize the number of turns on a battery powered memory.
HDT installs on its motors an absolute mechanical encoder type BiSS with 22bits of resolution on the single turn and 12 bits on the multi-turn or the battery-less BiSS encoder with 17Bit on single turn and 16bit on multiturn.

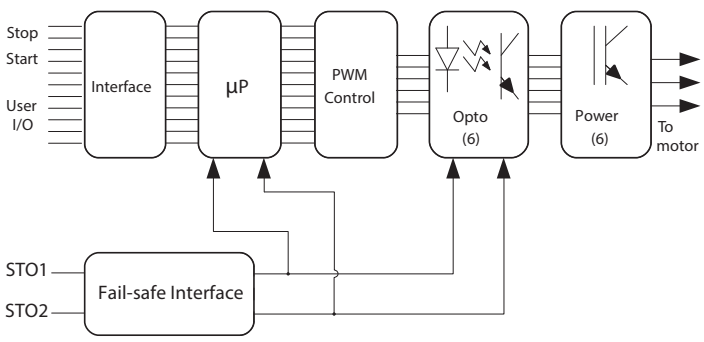
2=Sincos channels and Hiperface available only with Resolver option.

Safety circuit S.T.O.

The Safe Torque-Off (STO) feature of NTT drive is made of a redundant electrical circuit designed to bring a drive to a safe state of torque absence. It is a feature used to prevent unexpected motor rotation in case of emergency without the necessity to interrupt power supply. When STO function is active, the servodrive and the motor are in a state of functional safety, which means that is impossible to cause an active rotation of motor shaft or, if it is already rotating, the rotation stops by inertia.

The safety circuit implemented in NTT drive is manufactured and **certified according to IEC EN 61800-5-2 , with category 0 safety stop, and according to IEC61508 for SIL3 level.**
The safety stop category 0 is achieved with the immediate disconnection of electronic components (IGBT) responsible of system energization, that cause an uncontrolled stop of the axis, by inertia.

It is usual, in the applications where there isn't a drive equipped with STO, to secure the system interrupting the power supply using a power contactor of adequate capacity. **Using a STO it is possible to eliminate the power contactor with economical benefit**, space saving in the cabinet and achieving an higher level of security integrity.



Optional fieldbuses

Introduction. With the name "fieldbus" is identified a series of protocols for industrial networks, standardized in IEC 61158, used for control and communication in real time of a complex automated system.
A complex industrial automated system, for example an automated line of biscuits production, in order to work needs to exchange information with different priority levels and timing between different parts that compose the system, for example HMI, PLC, sensors and servodrives. While the interpolation on many axis requires drive synchronization with timing less than 1ms, the positioning management just requires 10ms, and to send the information of position reached to be displayed on HMI it is possible to wait 100ms.

So the different fieldbuses use rules to grant the "determinism" and the "isochronism", or respectively the ability to provide a request in a limited time known to prior (maximum known latency) and to grant a strictly repetitive behavior over time (low jitter).
Historically, the fieldbuses were born around a serial hardware structure like RS485. Among the most known fieldbuses there are ModBus, CanOpen and ProfiBus.
In the last years, Ethernet-based bus ,such as EtherCat and ProfiNet, have imposed themselves, preferred becouse to the higher speed and lower costs of Ethernet components.
The NTT servodrive offers a wide range of fieldbuses both serial and Ethernet like RTU, CanOpen CiA402, EtherCat CoE, ProfiNet RT and IRT.

EC
CM
PN
ST

EtherCAT®

ETHERCAT / COE
CiA 402 protocol
Electronic Gear
Position Mode
Velocity Mode
Profile Velocity Mode
Profile Torque Mode
Homing Mode
Interpolated Position Mode
Cyclic Sync Position Mode
Cyclic Sync Velocity Mode
Cyclic Sync Torque Mode
Touch Probe
Pressure Control
Servo-pump Control
Servo-cylinder Control
Winder, Unwinder
Thread-guide

CANopen®

CANOPEN
CiA 402 protocol
Electronic Gear
Position Mode
Velocity Mode
Profile Velocity Mode
Profile Torque Mode
Homing Mode
Interpolated Position Mode
Cyclic Sync Position Mode
Cyclic Sync Velocity Mode
Cyclic Sync Torque Mode
Touch Probe
Pressure Control
Servo-pump Control
Servo-cylinder Control
Winder, Unwinder
Thread-guide

Modbus

MODBUS
RTU Protocol
Speed control
Torque control
Electronic gear
Multi-positioner
Electronic cam
Pressure Control
Servo-pump Control
Servo-cylinder Control
Winder
Unwinder
Thread-guide

PROFINET

PROFINET RT & IRT (CC-C)
Profidrive Protocol
Speed control (AC1-AC4). Telegr. 1,3,20,120
Positioner in Program Mode (AC3). Telegr. 7,120
Manual positioner (AC3). Telegr. 9,120
Isochronous Position Control (AC4). Telegr. 5,6,105,106
Electronic Gear
Servopump. Telegr. 121
Servocylinder. Telegr. 122
Winder, Unwinder
Thread-guide Telegr. 123

STANDARD

STANDARD VERSION
Analogue and pulses train
Speed control
Torque control
Electronic gear
Multipositioner
Electronic cam
Servopump
Servocylinder
Winder, Unwinder
Thread-guide

EtherNet/IP™

ETHERNET IP
CIP Protocol
Speed control
Torque control
Electronic gear
Multipositioner
Electronic cam
Servopump
Servocylinder
Winder, Unwinder
Thread-guide

[1]Under development - contact HDT for availability

Optional fieldbuses

EtherCat CoE

The EtherCAT protocol is a standard for data exchange in industrial automation, generally defined as "fieldbus", of "open and realtime" type with high performances that uses the Ethernet hardware standard but with a different working principle in data exchange, defined as "on-the-fly".
In particular the standard Ethernet data pack (frame based on IEEE802.3) is no more received, interpreted and copied like a data process in every node. A master with a standard ethernet hardware send the telegrams to slave EtherCAT devices, equipped with modified ethernet hardware. These read the data addressed to them while the telegram passes through the device, processing the data "on-the-fly" and at the same time the input data are inserted while the telegram passes.
Among the different protocols on Ethernet hardware, EtherCAT offers the absolute best realtime performances, being able to elaborate up to 1000 I/O in 32.5 µs or 100 axis in 125 µs.
EtherCat supports the CiA402 profile of CANopen (CoE), and therefore, in terms of application, users who already use drives in CANopen will find the same variables and parameters they are familiar with.
Very high performance, economy of Ethernet technology and adoption of the CanOpen CiA402 profile made it in a short time the most widespread ethernet fieldbus in the industrial automation devices.

CanOpen CiA 402

The CanOpen protocol, acronym of Controller Area Network, is an open deterministic fieldbus "real-time" based on serial hardware. Designed to work on environments where is required an high immunity level, the bit rate can reach 1Mbit/s for networks shorter than 40m and uses as means of transmission a differential line. Different profiles exist for different applications.

In particular, the CiA402 profile define and standardize the functional behavior of controllers for servodrives and allows both interpolation and point-to-point operations. The bus, born over 25 years ago, is defined and managed by CiA IG (Can in Automation Interest Group).

ModBus RTU

The Modbus is a serial communication protocol (default RS485, but also RS232) of open type created in 1979 to put in communication PLC's with electronic industrial devices.
It is wide spreaded and cheap to handle, although it does not boast great speed it suits itself very well to give commands with time of about 20ms. Modbus allows the communication between different devices connected to the same network and it is often used to connect a supervisor HMI with a remote terminal unit (RTU) in supervision control and data acquisition system (SCADA).
HDT manage the Modbus protocol RTU type, widely used in industrial automation.

ProfiNet RT and IRT certified by PROFIBUS & PROFINET International

ProfiNet (acronym for Process Field Net) is an open and Real-time field bus based on standard Ethernet technology (std. IEEE802.3) and suitable for data transfer between devices in an industrial environment. ProfiNet has 3 levels of data transfer based on the field of use, performance and complexity. A first level Non-Real-time for applications where timing is not essential and for data transfer via standard TCP/IP and UDP/IP. This channel is used for parameterization, configuration and acyclic read and write operations. The cycle time is> 100 ms. The deterministic profile ProfiNet RT (Real Time), used for the transfer of cyclic data, exchanged periodically. Data sent via RT bypasses the TCP/IP interface to accelerate data exchange with PLCs, allowing you to create applications with cycle times <10ms. This profile is comparable in functionality to ProfiBus DP V0 and suitable for I/O management or positioning. The IRT (Isochronous Real-Time) profile is the high-speed protocol used for Motion Control applications and requires slave devices that are perfectly synchronized with the master and requires specific hardware from them. This profile allows for cycle times <1 ms. HDT has developed both the RT protocol and the IRT protocol in classes AC1, AC3, AC4, certified by PROFIBUS & PROFINET International (PI).

EtherNet IP

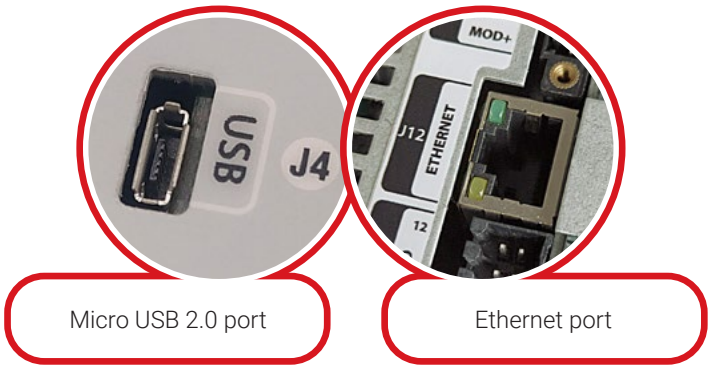
EtherNet/IP (IP = Industrial Protocol) is an industrial network protocol that adapts the Common Industrial Protocol (CIP), US industry standard, to the Ethernet standard. EthernetIP exploits, for sending data, the physical infrastructure and technologies of standard Ethernet, such as Internet protocols and IEEE 802.3, the IP layer, TCP and UDP. EtherNetIP is one of the main industrial protocols in the United States and is widely used in a wide range of industrial sectors although it cannot be considered a protocol for motion control, but more for I/O management as it is not deterministic as it cannot manage axes synchronized with times less than 100ms and is classified as a class 1 Real-time protocol with times greater than 100ms.
It can support many network topologies such as star, tree and ring and with an unlimited number of nodes.

Software tool: Caliper

CALIPER is the software tool designed to simplify the calibration of your servodrive and motor with Microsoft Windows operating systems. A specific grafic interface extremely intuitive speeds up and make it even more simple to access the full range of functions of all the HDT servodrives. In addition to selecting the applications, save and load data, Caliper includes a powerful professional oscilloscope, autophasing tools, automatic cogging reduction, observer for vibrations, fieldbus analizer and many other applications to help you tune your applications at best. The communication is via Micro USB 2.0 port or Ethernet port, and therefore it doesn't need special cables or serial converters.

MAIN FEATURES:

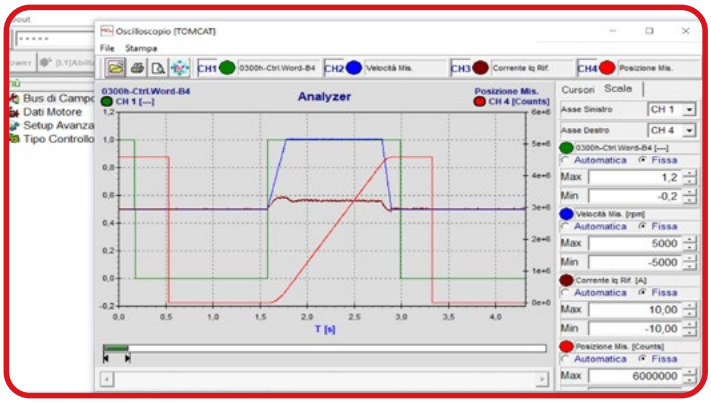
- Drive configuration
- Reading, loading and saving of drive parameters, display alarms.
- Possibility to connect via USB Hub different drives and to control them simultaneously from Caliper selecting the specific drive.
- Possibility to connect remotely by VPN.
- Oscilloscope with 4 configurable channels with the possibility register, save and print the measures taken.
- Motor autotuning and autophasing
- Selection and configuration of operative mode:
  - Torque control
  - Torque limit control
  - Speed and positioning control
  - Multi-positioning
  - Electronic Axis
  - Electronic Cam
  - Pressure Control (Hydraulic Press)
  - Servocylinder control
  - Pressure Control
  - Filters

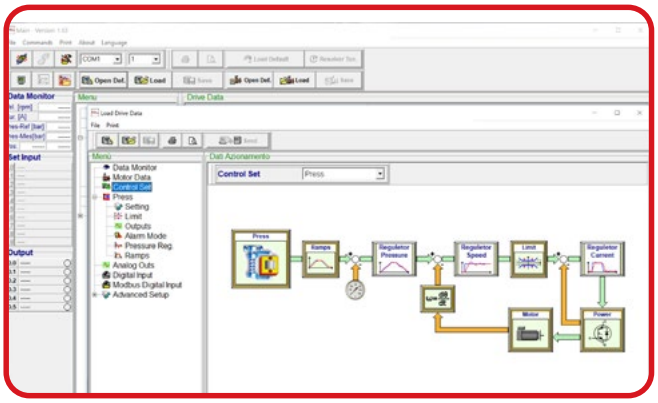


4-channel digital oscilloscope in real time

Flagship of Caliper software from the beginning, the new 4 channels oscilloscope allows to sample signals at 100µs via the fast Micro USB 2.0 port. All channels are selectable, recordable, savable also as picture or PDF format.

A convenient wave function generator feature is available, useful to perform the tuning of control loop without having to phisically remove the axes. Data gathered during observation can be saved and printed in order to be shared or stored.





Intuitive Interface.

Clear and logic interface, off-line data input, multi-language mode (english, italian, french, turkish and chinese), simplify the navigation in menus and commands. Important parameters accessible only with password. "Operator enable" security function to avoid accidental manumissions.

Easy parameterization

Rationalization of the parameters, the use of block diagrams and the graphical representation of the applications simplify the parameterization of the drive. Ability to save and load axis calibration data and motor data.

Position Control: Multi-positioner

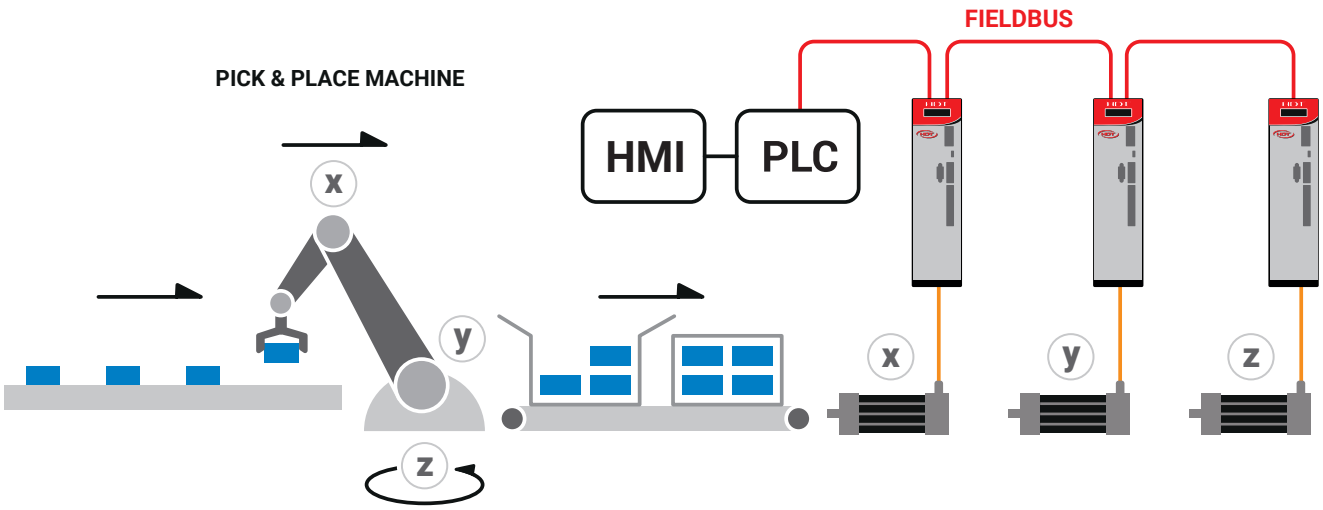
The NTT servodrive integrates a "multi-positioner" operating mode with 4 selectable modes.
The positioner application generates a speed profile to reproduce a motion trajectory with controlled acceleration and jerk, allowing accurate positioning. The profile calculation is performed in real time allowing to modify on-the-fly the position target with time lower than 1 millisecond. This allows to manage in a fast way different motion profiles.
The positioner includes a functionality called "stop on marker" that allows to perform a controlled position stop when a sensor signal is detected by a digital input of the drive during the execution of the trajectory.

Single target positioner.
This mode can be activated both with digital/analog input and with all fieldbuses.
The drive configured in this way allows to generate a trajectory profile only for a target defined as position target, with speed, acceleration, deceleration and jerk. The positions can be absolute or relative.
Using the fieldbuses, all parameters can only be set on the fly by telegram; only the Modbus RTU allows to work with maximum flexibility using both modbus commands and digital/analog input commands.
In case a fieldbus is not available, position and speed can be set in analog mode via the respective input, while the other parameters can be set via Caliper software.

Positioner with table of targets.
This mode can be activated both with digital/analog inputs and with Modbus RTU and ProfiNet RT.
The positioner allows to manage a maximum of 64 targets. As with the single target, for each target it is possible to set position, speed, acceleration and jerk. The positions can be absolute or relative.
The targets are wrote in a table on the drive via Caliper or via fieldbus.
The targets can be executed individually or linked in different ways allowing to generate more complex profiles.
It is possible to cycle automatically the series of linked targets and to interpose a waiting time between one target and the other.

Cyclic positioner.
This mode is similar to the positioner with target from table, with the difference that the targets are strictly executed one after the other.
The targets can be activated manually via I/O or via Modbus RTU.
The option to make the sequence of set dimensions cyclical is provided.

"Input-start" positioner.
This mode allows to synchronize the starting of an axis with the reaching of the position of another axis, without the necessity to use a PLC. It is different from the previous one because the input that selects the target or the group of linked targets also becomes the start command of the target itself. The "reached position" signal can be activated on each of the digital output of the drive.
Therefore, connecting one of the output of reached target of a NTT servodrive with the input of another NTT servodrive, it allows the synchronized starting of the latter.
This mode only works with digital/analog inputs and with Modbus RTU fieldbus.

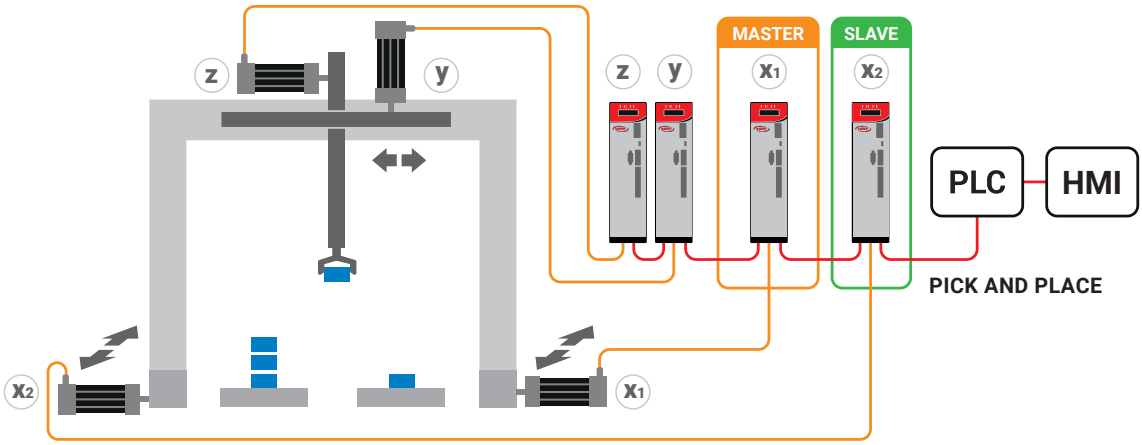


Position control: Electronic gear

The electronic gearboxes is a standard feature of the servodrives that allows to set a transmission ratio between one or more motors, where a slave axis, or "follower", follows a master axis according to a preset ratio. This ratio is set in the slave drive and can be modified at will.The movement of the master is measured with an encoder, which signal is sent to the input of the follower drive, that follows according the set ratio.

The "electronic gear" replicates the mechanical transmission principle, in the same way that happens in a reducer, recirculating ball screw, a rack or a pulley and belt system. The transmission with mechanical reduction allows to change speed, to increse torque and helps to reach the match of inertia between motor and load. The electrical axis function, compared to mechanical reduction, only regulates the speed but with the advantage of allowing to change on will and to eliminate backlash and deterioration typical of mechanical systems.

It is possible to connect different slave axes to a single master axis, with different electrial gear ratio. When managing the electrical axis, It is important to calibrate the parameters of slave axis, especially response times.



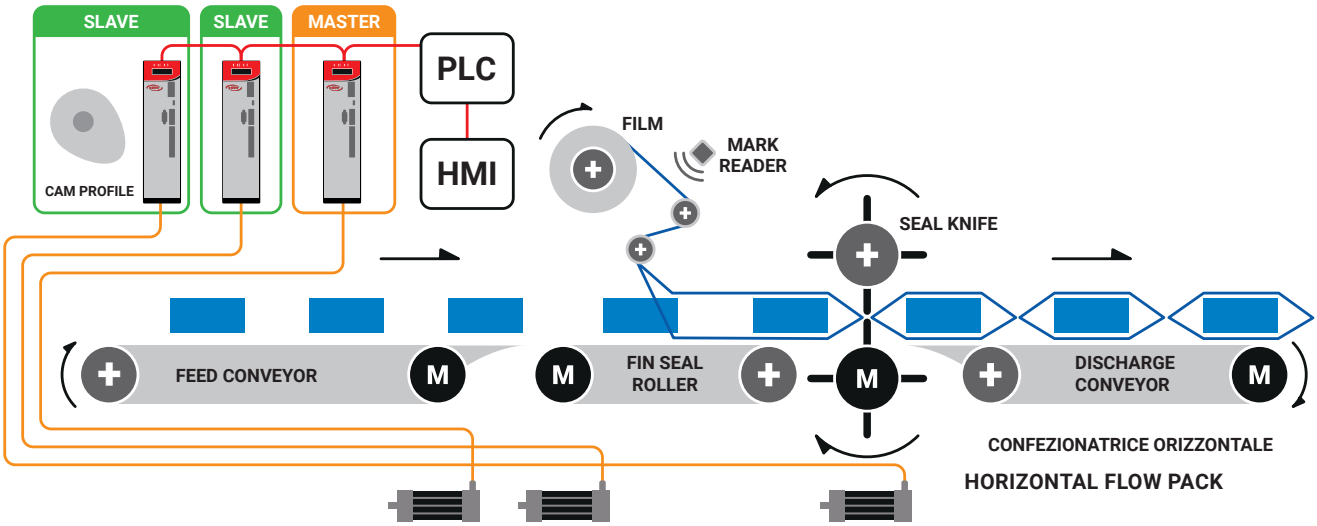
Electronic cam control

The electronic cam is a feature that replicates the concept of mechanical cam. The mechanical cam is an element with irregular shape (tipically ovoid) fixed to a rotating shaft of an axis and wihich moves another mechanical parts that follows and reproduces the profile.

In the electronic cam, the mechanical regulation is replaced with electronic. A cam profile is defined via a X/Y table with a maximum of 576 interpolate points.

Unlike the mechanical cam, where the cam profile is fixed to master axis, in the electronic cam the profile is inserted in the servodrive that drives the follower motor.
The "slave" axis receive the space reference of the "master" axis and replicate the profile described in the table of X/Y points, generating the resulting motion.
The signal of the master axis can come from an esternal encoder or from the signal of a simulated encoder of a servo axis.

The benefit of the electronic cam compared to the mechanical one is evident in the flexibility to manage more than one profile, to be able to modify the profile very easilyu in any moment and not least the reduction of mechanical backlash and the corresponding adjustments that follow.



Control methods and applications

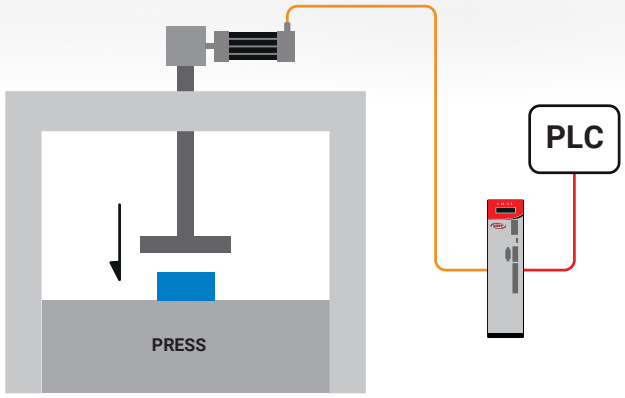
Torque control

The torque control is an application that allows to control the torque provided by the motor thanks to a torque reference managed by an analog input or a command sent via ModBus, CanOpen EtherCat or Profinet.

The torque reference that is provided is proportional to the rated torque of the motor.

According to the type of reference you work with, in Caliper software it is possible to set different parameters, for example:

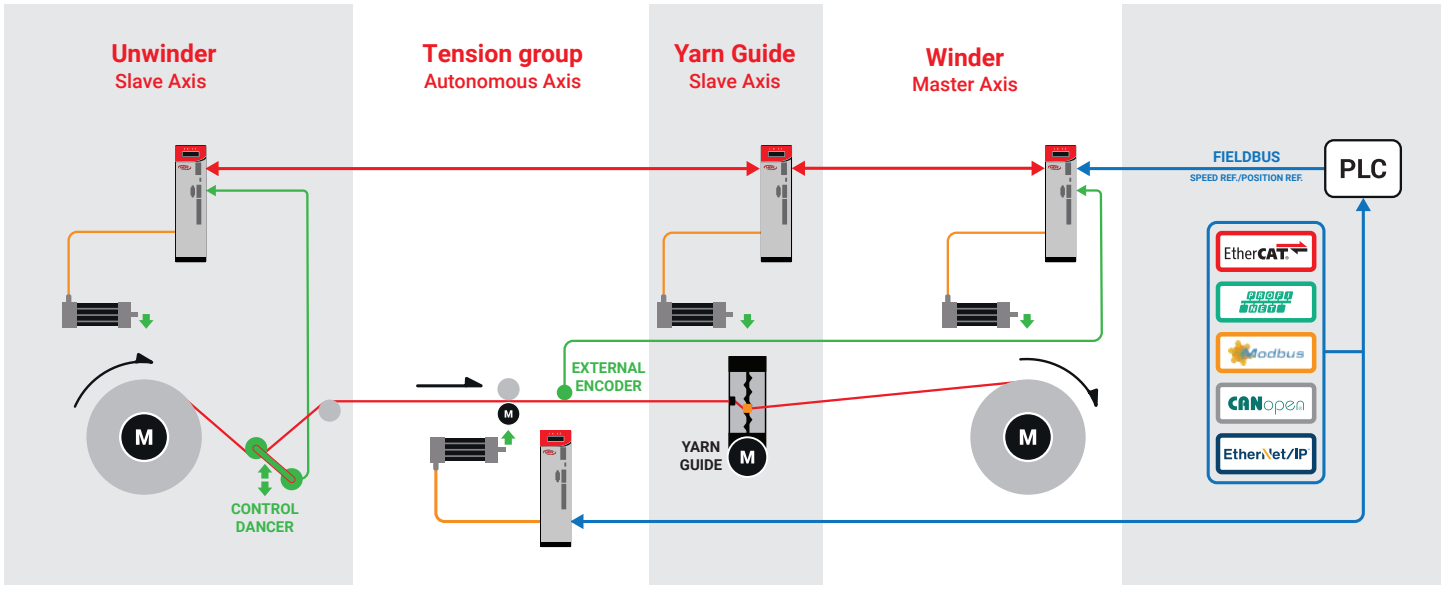
- Full-scale of analog input
- Optimal PID controllers for the application
- The desired digital I/O.



Example of drive connected to an electric cylinder for torque control.

Winder, Unwinder, Yarn Guide

Application for the management of an unwinder/winder system complete with pulling unit and a yarn guide. The external PLC communicates the references to a Master Winder drive which autonomously manages all the other slave axes.



Example of thread unwinding line with control dancer and yarn guide

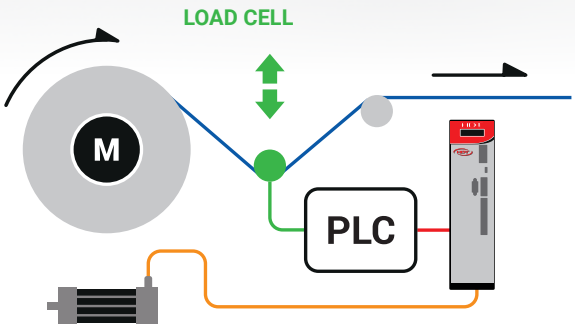
Speed control and torque limit

The speed control is a mode that allows to control the speed of the motor via a speed reference, managed by:

- An analog input
- A frequency input
- A fieldbus command

In I/O or Modbus mode it is possible to use an additional analog auxiliary speed reference or torque limit reference.

Therefore, it is possible to work in speed control mode, limiting the maximum torque output by imposing a limit threshold.



Example of drive connected to a mechanical dancer with load cell.

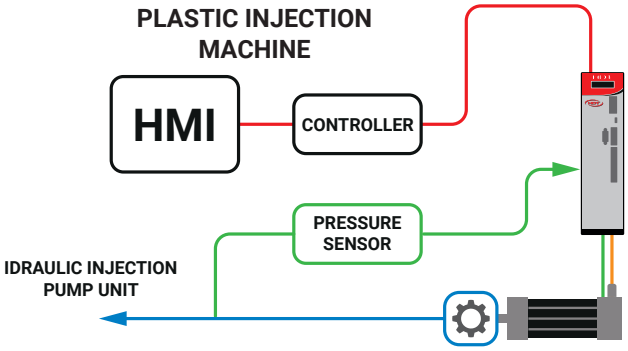
Pressure control for servo pump systems

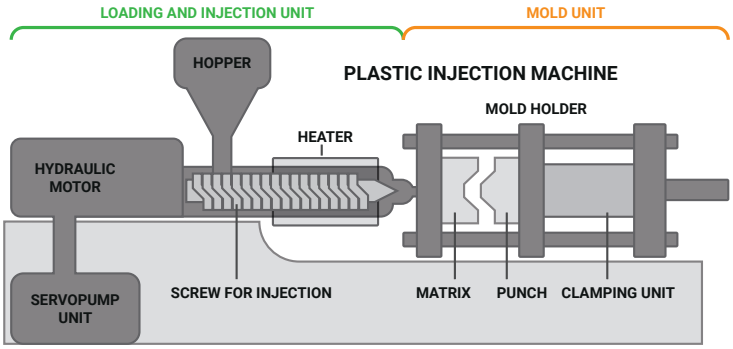
The NTT servodrive integrates an operating mode called "pressure control", designed specifically for the operation of applications that use servo pumps such as in presses and injection molding machines or applications that combine a hydraulic system with an electric regulation with drive and brushless motor.

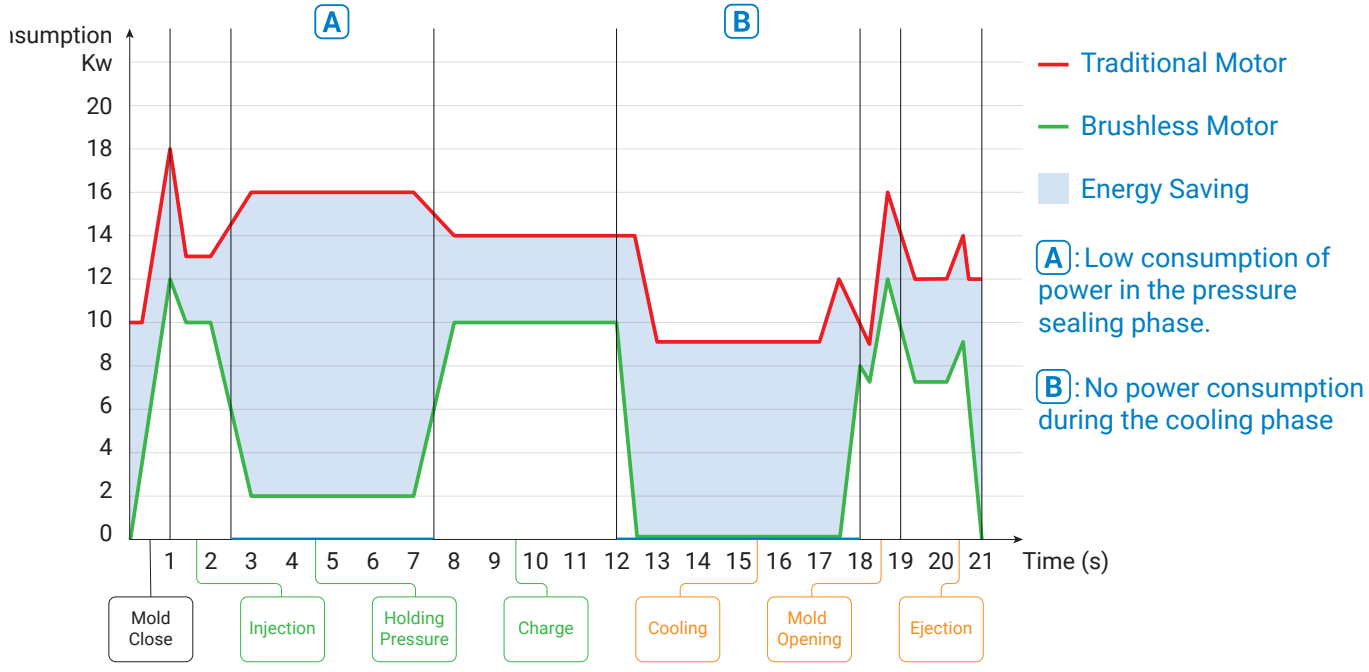
By activating this mode in the NTT servodrives, three inputs are enabled. A first input for the speed reference signal used to regulate the speed of a motor connected to a pump and therefore its flow rate.
A second input is enabled to receive the pressure reference signal while a third input is enabled for the pressure transducer signal (pressure feedback). The two pressure signals are compared and the servodrive exercises a speed control to keep the actual pressure equal to that of the reference.

The combination of NTT with a brushless servomotor thanks to this application allows to replace a traditional system with pump and asynchronous motor, obtaining an incredible benefit in the efficiency of the system.
Energy consumption is drastically reduced, the oil temperature in the circuit is reduced, the hydraulic system is simplified thanks to the elimination of the proportional valves and better control is exercised on pressure and flow which affect the quality of the product.
Control system with minimum response times that allow precise motion control with significant improvements in processing quality.

The drastic energy saving is due to the fact that NTT allows the motor to be stopped while keeping the system under pressure with a power absorption close to zero, when, on the other hand, with traditional systems equipped with an asynchronous motor, the motor is forced to rotate at fixed speed. around 1500rpm to maintain system pressure even if the application is not working.
As a consequence, a pump equipped with NTT is managed at variable speed and allows to reduce the heating of the system compared to a circuit that works constantly at fixed speed even just to maintain the pressure. This improves the circulation of the oil in the system which is kept at low temperatures allowing the installation of small radiators. The servodrive allows maximum repeatability in the regulation of flows, guaranteeing a better quality of the produced product.
Furthermore, among the motors, the brushless is the one with the highest efficiency, settling on values around 95%. Last but not least, the system is much quieter and with smaller dimensions.





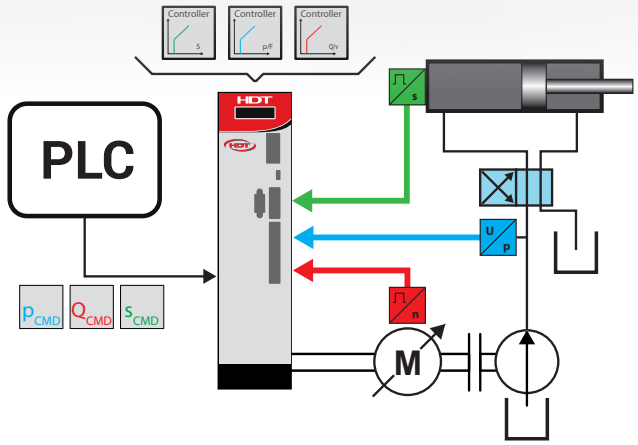


Servo-cylinder control

Application designed for the management of an hydraulic cylinder. By activating this mode, the servodrive regulates a servo pump in an hydraulic circuit by finely controlling the position of an hydraulic actuator or cylinder inserted in the circuit itself, whether it is equipped with a linear position transducer or without a sensor.

Open loop circuit
- Without linear encoder on the cylinder
- Positioning with precision> 10mm
- Without error compensation

Closed loop circuit
- With linear encoder on the cylinder
- Positioning with accuracy <1mm (0.2mm)
- with error compensation



Example of drive connected to a hydraulic cylinder in a closed loop circuit

Operating modes

NTT servodrive	Drive Configuration					
Control Mode	Standard	RTU Modbus	Canopen CiA 402	Ethercat COE	Profinet RT and IRT	Ethernet/IP CIP
Speed	YES	YES	YES	YES	YES	YES
Torque	YES	YES	YES	YES	YES*	YES
Position	YES	YES	YES	YES	YES	YES
Electronic gearbox	YES	YES	YES	YES	YES*	YES
Electronic cam	YES	YES	NO	NO	NO	YES
Servopump	YES	YES	YES	YES	YES	YES
Servocylinder	YES	YES	YES	YES	YES	YES
Touch probe	NO	NO	YES	YES	YES	NO
Winder-Unwinder-Yarnguide	YES	YES	YES	YES	YES	YES

* Under development

Order Code

Drive type:

Power supply voltage:
- 240 = 230Vac / 300Vdc
- 460 = 400Vac / 540Vdc

NTT 2 4 0 - 3 / 6 - C M - R -

Size in current unit:

1 / 3	4 5 / 9 0
3 / 6	4 5 / 1 5 0
6 / 1 2	7 5 / 1 5 0
1 0 / 2 0	1 0 0 / 2 5 0
2 0 / 4 0	1 5 0 / 3 7 5
3 5 / 7 0	2 0 0 / 5 0 0

Fieldbus options:
- ST = No Fieldbus
- EC = EtherCat
- PB = Profibus
- CM = CanOpen/ModBus
- PN = Profinet RT-IRT - Ethernet IP

Feedback options:
- R = Resolver
- (blank) = No Feedback Option

Versions:
- (blank) = No versions

EXAMPLE:	NTT 240-3/6-CM-R	NTT 230Vac - 3/6A - With CanOpen/Modbus option and Feedback Resolver option

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Motors & Digital Drives

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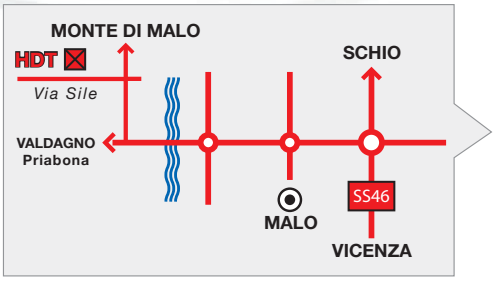

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