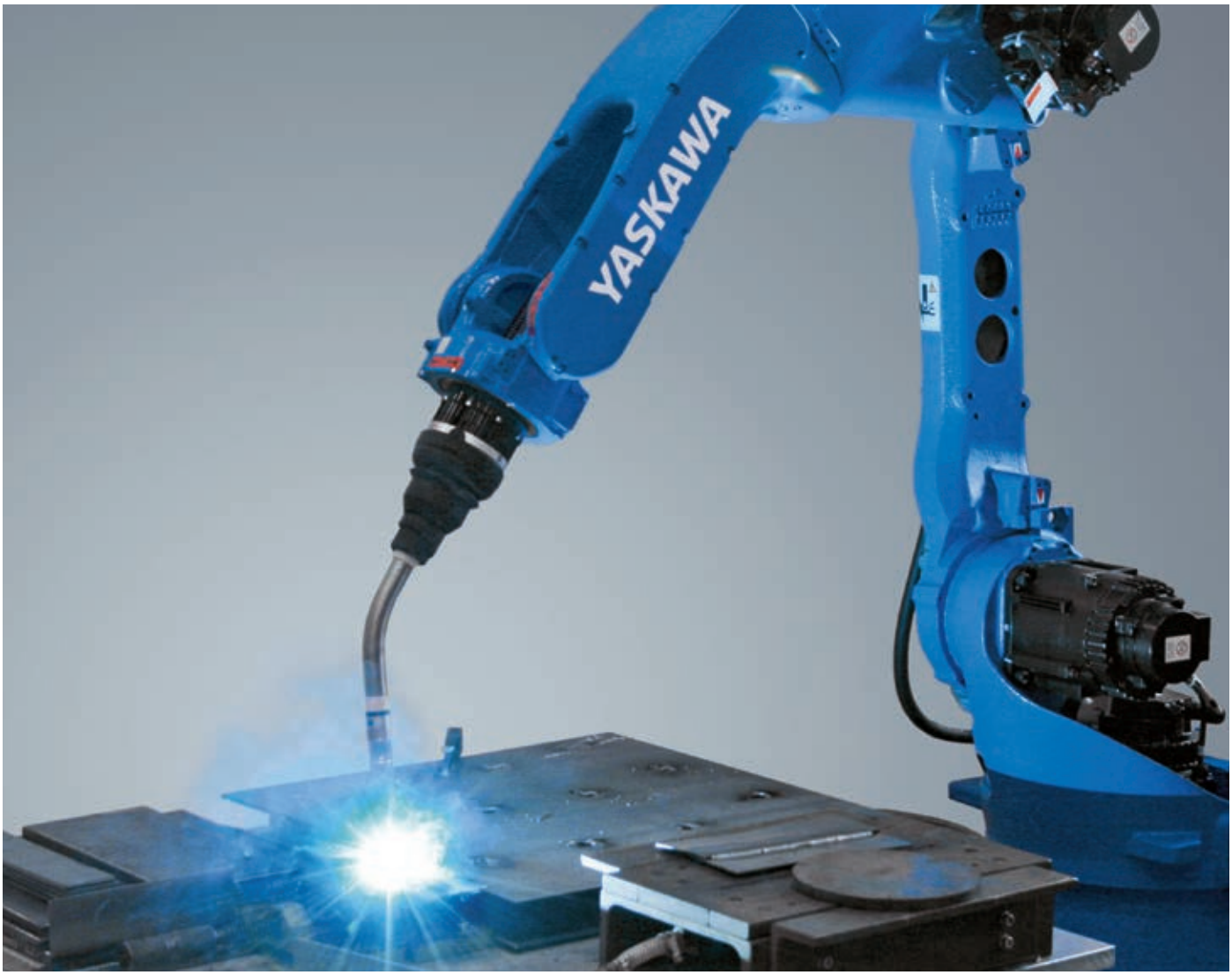
YASKAWA

Welding Lines and Systems

Efficient, process-reliable, fully synchronized

www.yaskawa.eu.com

Masters of Robotics, Motion and Control



Contents


YASKAWA
YASKAWA

ALL IN ONE – About us

With more than **350,000** units installed worldwide, YASKAWA is one of the largest manufacturers of industrial robots. Our extensive range covers nearly all options for robotic **arc, spot and laser welding,** the corresponding drive and control technology, and turnkey automated welding systems – from **standard cells** to complex, **customized** systems.

Our systems are characterized by

Efficiency

- Maximum process velocity
- Fast product changeover
- Jigless welding with cooperating robots

Process reliability

- Low susceptibility to faults
- Constant processing results
- Low welding distortion

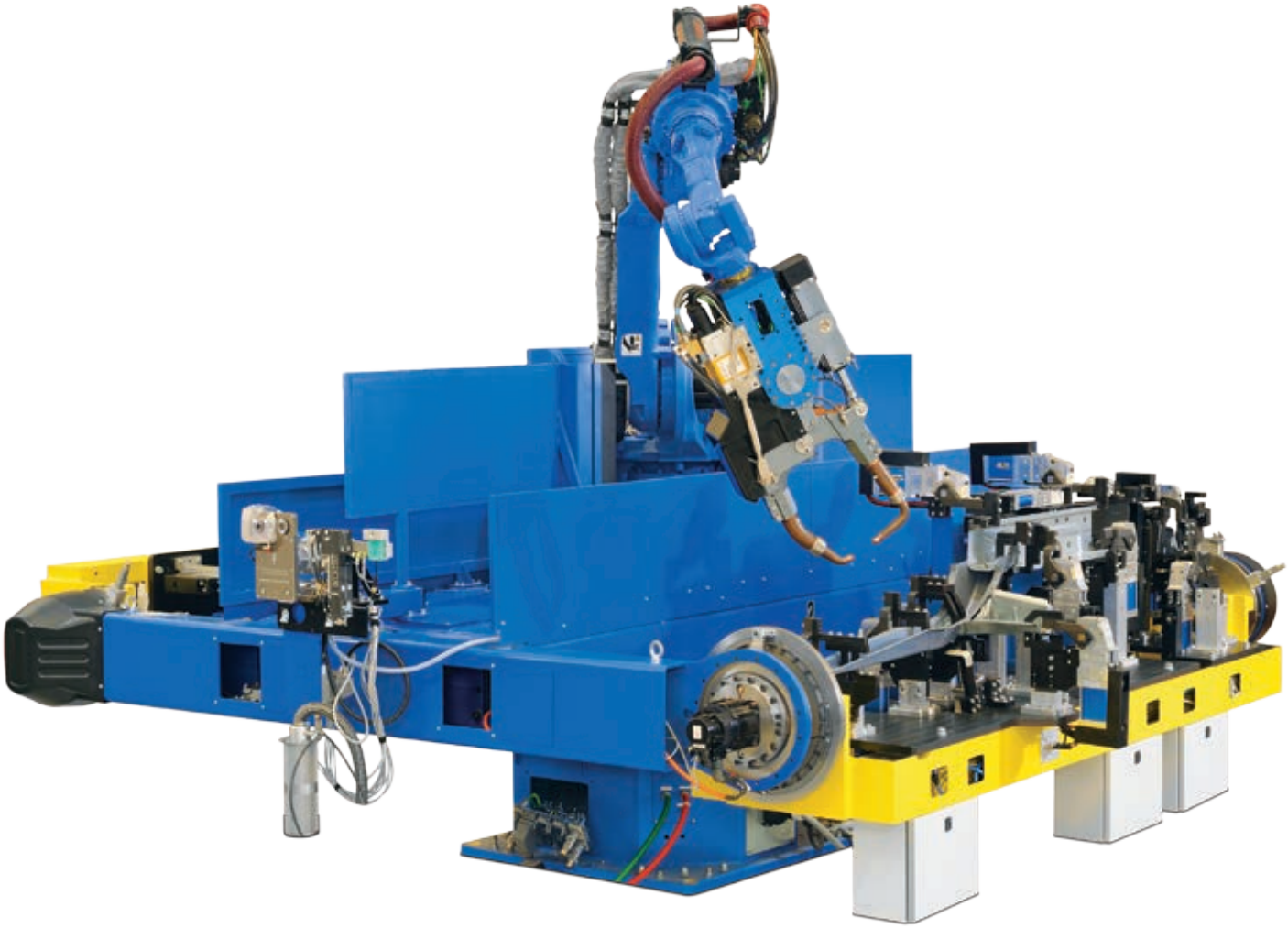
Synchronization

- Full synchronization assured by joint control of robot and positioner
- Multi-Robot technology
- Optimum welding sequence
- Cycle time optimization

Cost savings
Minimized space requirements
Customer satisfaction
Everything from a single source

Selection Customer Reference List Welding

- ABG
- ALPINE Engineered Products, Inc.
- Amazone
- Andritz
- Arburg
- Atlas Copco
- Benteler
- Beyeler
- BMW
- Bosch
- BOYSEN
- CLAAS
- Daimler
- Diem
- Doka
- Eberspächer
- Emerson MMI
- Faiveley
- Faurecia
- Felder
- GE Jenbacher
- HDG
- HITACHI
- Honda
- Hoval
- Isringhausen
- John Deere
- Johnson Controls
- Jungheinrich
- Kahlbacher
- Kasteel Metaal
- Kermi
- Kesseböhmer
- Komatsu
- Krones
- KTM
- Kubota
- Leifheit
- LUK
- MAGNA
- Mercedes-Benz
- NedCar
- Palfinger
- Pema Welding
- PERI
- Posch
- Pöttinger
- PSA
- PWO
- Radkersburger
- Renault
- RiKa
- Rosenbauer
- Scheppach
- Siemens
- TENNECO
- Thyssen Automation
- Toyota
- TRUMPF
- VW
- Westfalia
- Winterhalter
- ZF Sachs



Customer Service and Support.

From the Initial Concept to the Turnkey System.

With more than 30 years of experience in system development and engineering, and wide-ranging expertise in robot technology, YASKAWA offers an all-round package tailored to your needs. Consulting also receives high priority: even if you have only a vague notion of how your workpiece is to be welded, YASKAWA will draw up a concept for you, integrate the required components and present you with a solution that will fire your imagination.

Consulting

- In-process engineering services

Testing

- 3D simulation
- Prototyping and pre-series production on test systems
- Performance of welding trials
- Quality control by macrosections

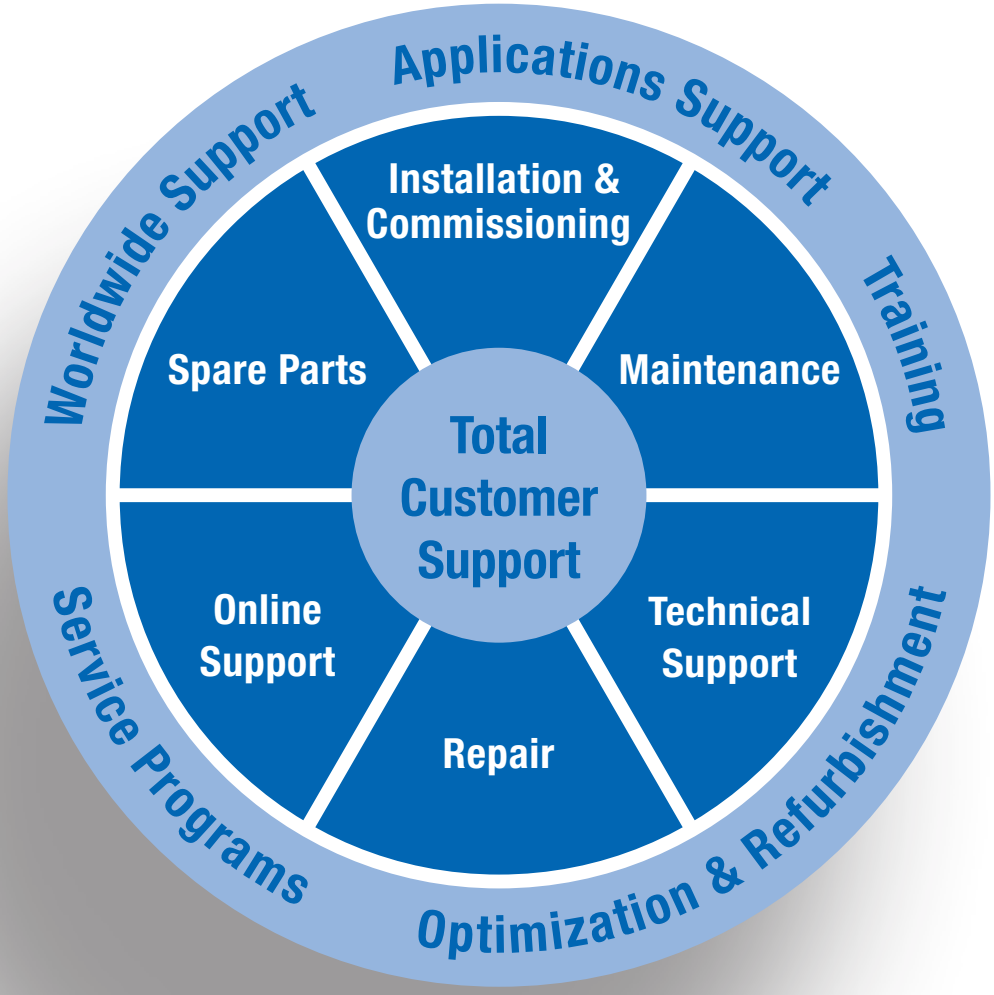
Training

- Operator training on site or in our Academies
- Welding training

Service

- Maintenance and repair
- Overhauls and refurbishments

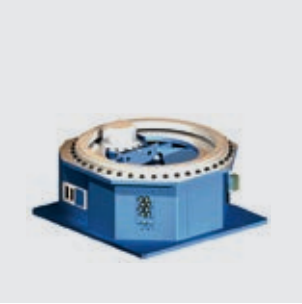
TCS. Total Customer Support.



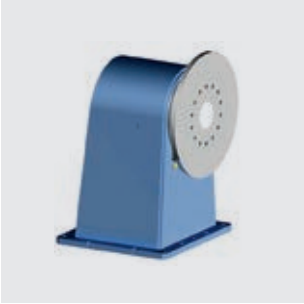
System Components

Positioners
Tracks
Gantries
Hydraulic Locking Devices
Jig Manufacturing

Base Drives / Turntables

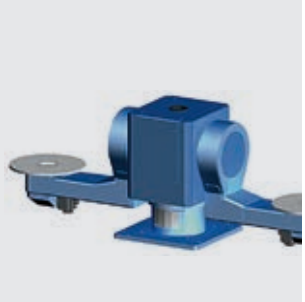


Positioners Headstock Type



Positioners Tilt-rotation

Positioners L-Type



Positioners C-Type

Multi Station Turntables

Tracks

Gantries

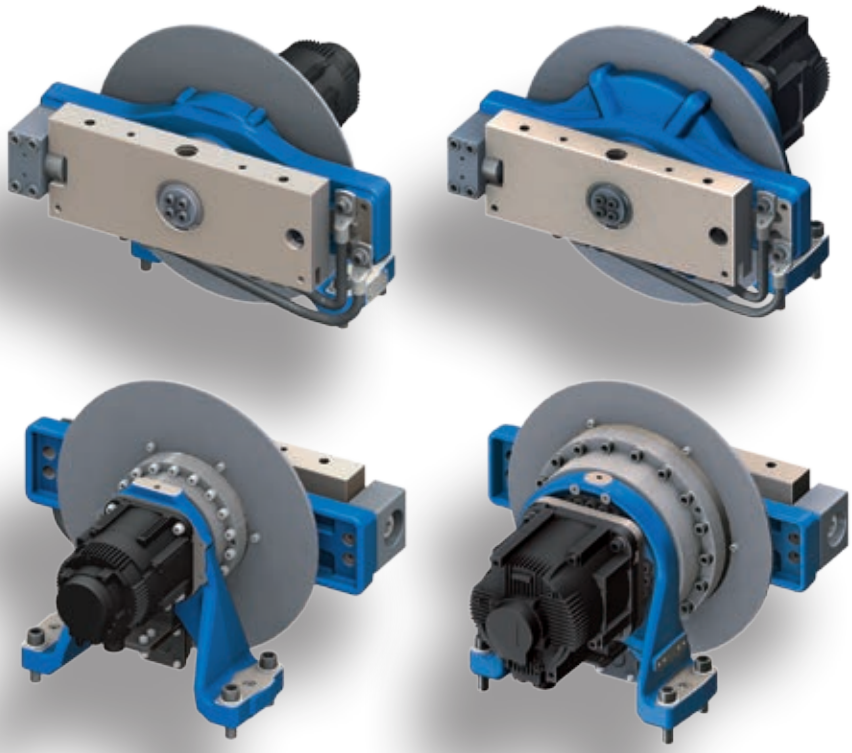
Locking Devices

Positioner

Headstock module

Headstock HM

with MotoMount
fixture bracket



Front and back view

Part No. 140335-101

Part No. 140365-101

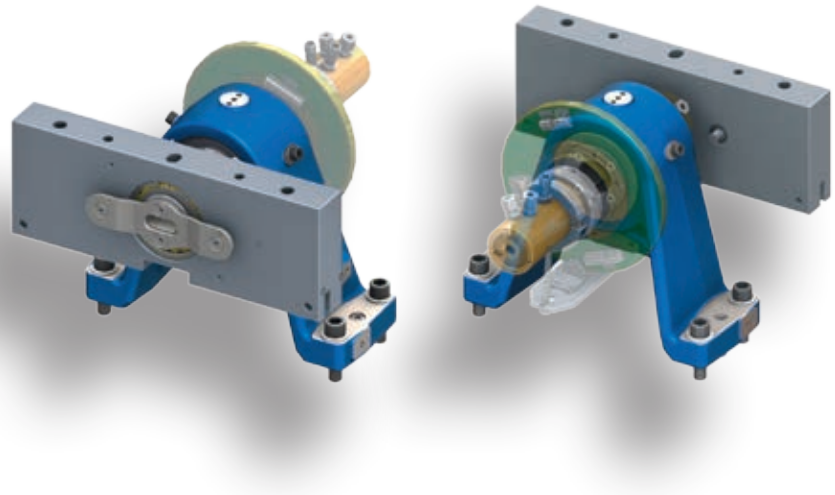
Technical data		HM-500D	HM-1000D
Part No.	**MotoMount**	140335-101	140365-101
Max. capacity	**load** **offset**	500 kg 191 mm	1000 kg 219 mm
Motor power		1.3 kW	3.0 kW
Gear ratio	**reducer**	165:1	170:1
Speed	**nominal** **maximum**	9.0 rpm 23 rpm	8.8 rpm 23 rpm
Torque	**rated** **continous rated** **peak torque**	1177 Nm 941 Nm 2354 Nm	2689 Nm 2151 Nm 5378 Nm
Workpiece data	**max. diameter** **max. inertia**	1600 mm 250 kg/m^2	1600 mm 635 kg/m^2
Rated welding current Standard	**100 %** **60 %**	350 A 460 A	350 A 460 A
Rated welding current Option	**100 %** **60 %** **35 %**	860 A 1120 A 1380 A	860 A 1120 A 1380 A

Tailstock TM-1000 for YEU options

With MotoMount fi xture bracket,
suitable for YEU positioner options.

Maximum payload 1000 kg

Part No. 140320-103
Front and back view

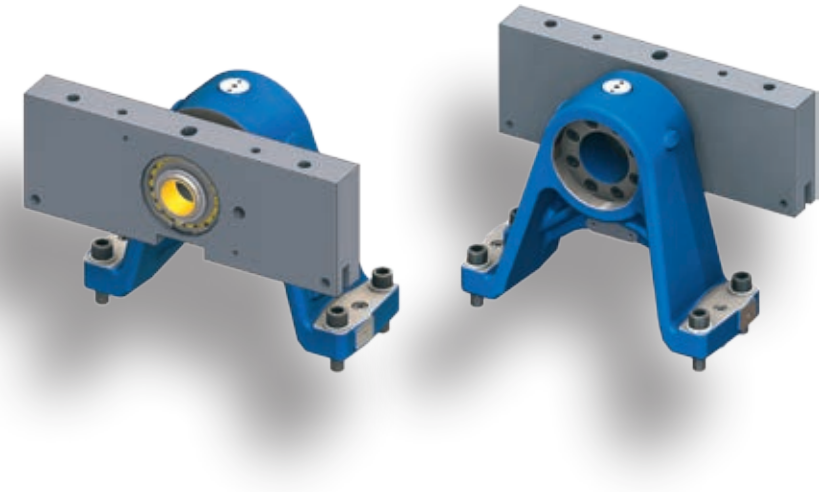


Tailstock TM-1000

With MotoMount fixture bracket.
Options for air and signals.

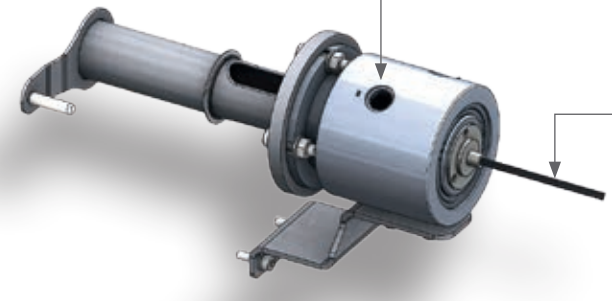
Maximum payload 1000 kg

Part No. 140320-101
Front and back view



Part No. 141450-100
2x 3.8” direct air

Part No. 141450-101
2x 3.8” valve controlled air



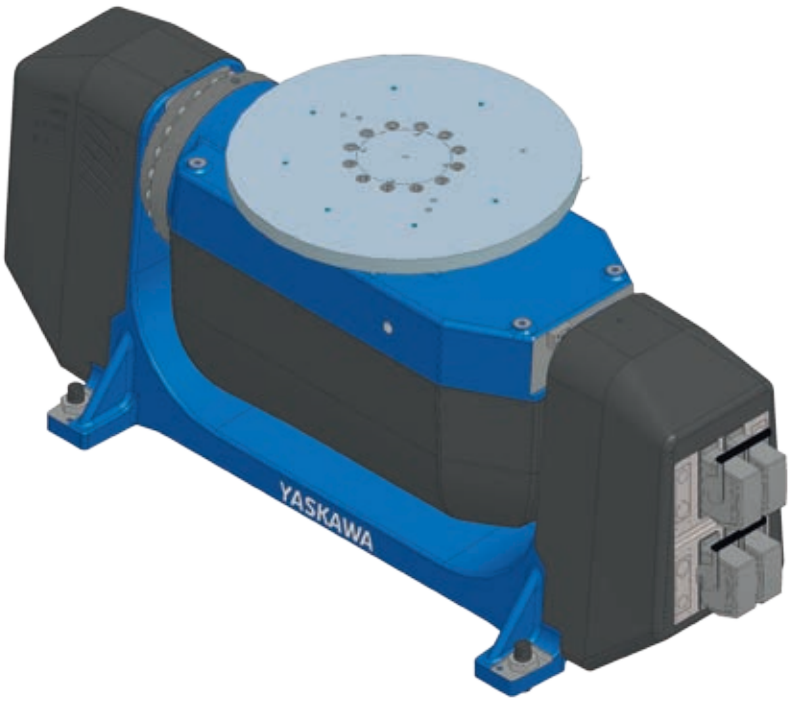
Part No. 141475-100
2x 3.8” air + 12 channels I/O +PE

Part No. 141475-101
2x 3.8” air + 24 channels I/O +PE

Part No. 141475-102
2x 3.8” air + 4 channels + Fieldbus + PE

Part No. 141475-103
2x 3.8” air + 4 channels + Profi net + PE

TR-1000



1-station Compact Positioner

The TR-1000 is a positioner that provides one tilting and one rotational axis. Despite the compact design, it is one of the most powerful positioners among YASKAWA portfolio.

The compact design enables the implementation of space saving and flexible system concepts. Due to the low construction, loading height can be adapted to the ergonomic requirements by corresponding sockets.

This positioner can handle jigs and work pieces up to a weight of 1000 kg and a maximum diameter of 1200 mm. The center of gravity of the jig can be up to 400 mm above the faceplate. This allows great flexibility in design of the jig.

The hollow shaft drive of the faceplate allows to feed different media through to the jig. Media feed through can be realized as endless turning solution.

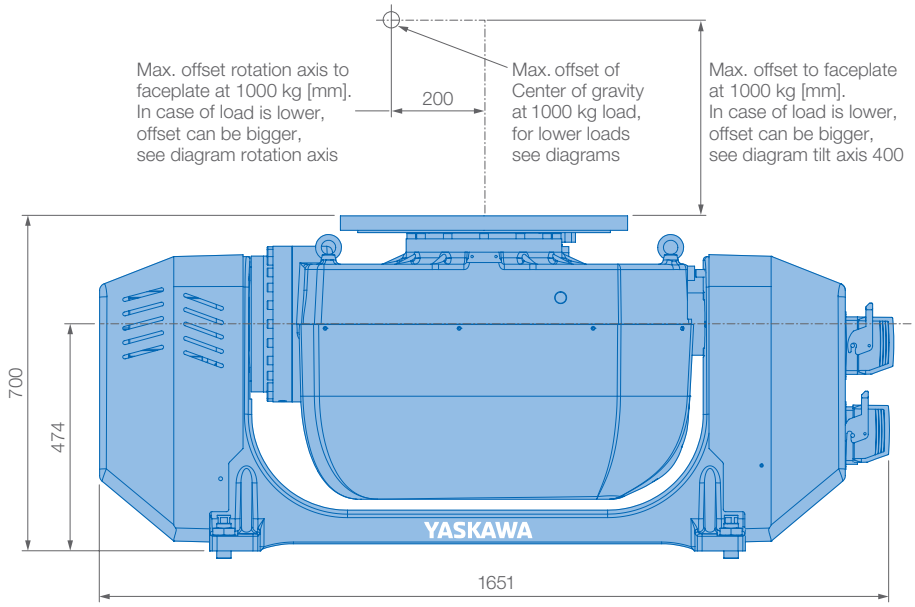
For welding applications two connectors for welding current (each max. 360A) are available.

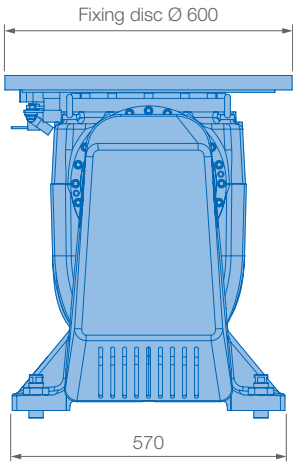
KEY BENEFITS

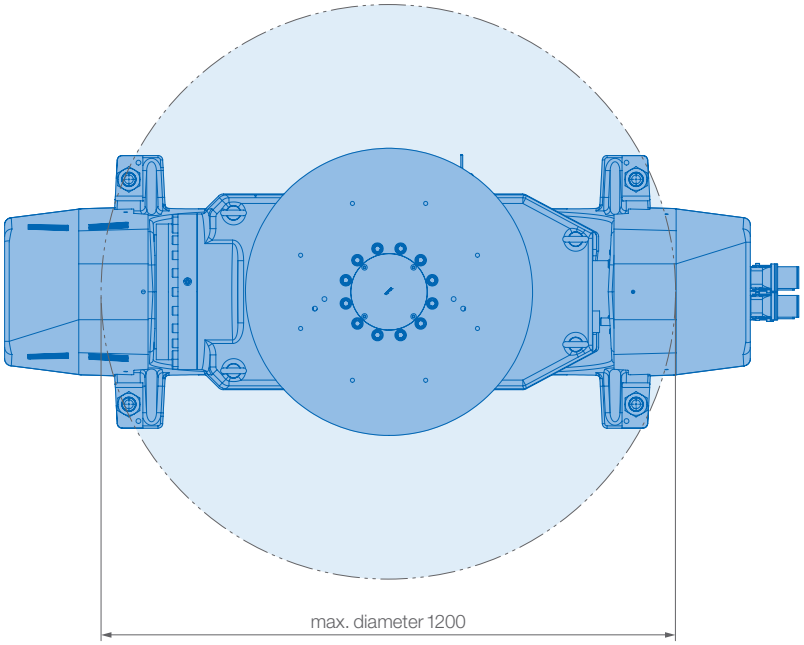
- Compact, flexible and economic
- High payload: max. 1000 kg
- Large working range: 1200 mm
- Hollow shaft drive for media feed through

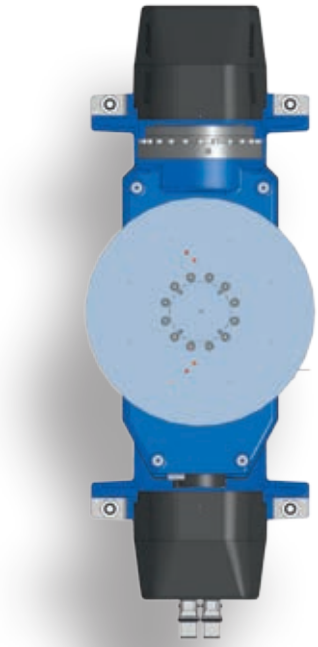
Technical data	
Rated load [kg]	1000
Diameter of load [mm]	1200*
Max. tilt speed [U/min]	12
Max. rotation speed [U/min]	22.4
Tilt-angle [°]	± 90*
Max. distance COG to faceplate at 1000 kg [mm]	400
Max. distance COG to rotation axis of faceplate at 1000 kg [mm]	200
Rated load inertia tilt-axis [kg · m²]	517
Rated load inertia rotation-axis [kg · m²]	645
Rated holding torque tilt-axis [Nm]	7800
Thru-hole rotation-axis [mm]	85
Rated weld current [amps a 100% duty]	2 x 360

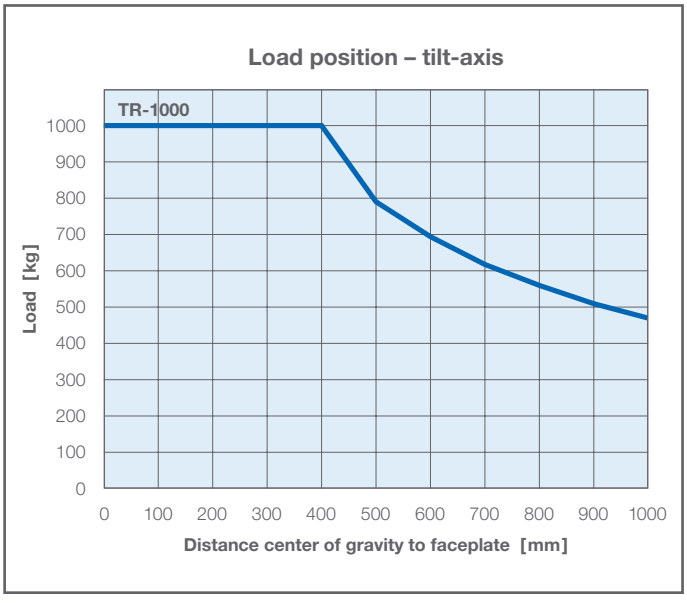
* For diameters of load greater than Ø 900 mm and necessary tilt of 90°, use additional socket for the positioner in order to avoid collision of the work piece with a base plate or floor.

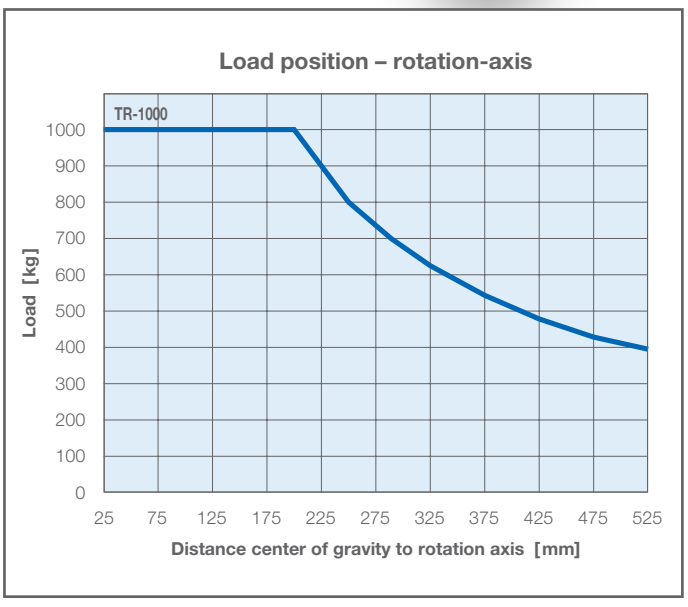

Max. offset rotation axis to faceplate at 1000 kg [mm]. In case of load is lower, offset can be bigger, see diagram rotation axis
200
Max. offset of Center of gravity at 1000 kg load, for lower loads see diagrams
Max. offset to faceplate at 1000 kg [mm]. In case of load is lower, offset can be bigger, see diagram tilt axis 400
700
474
YASKAWA
1651


Fixing disc Ø 600
570

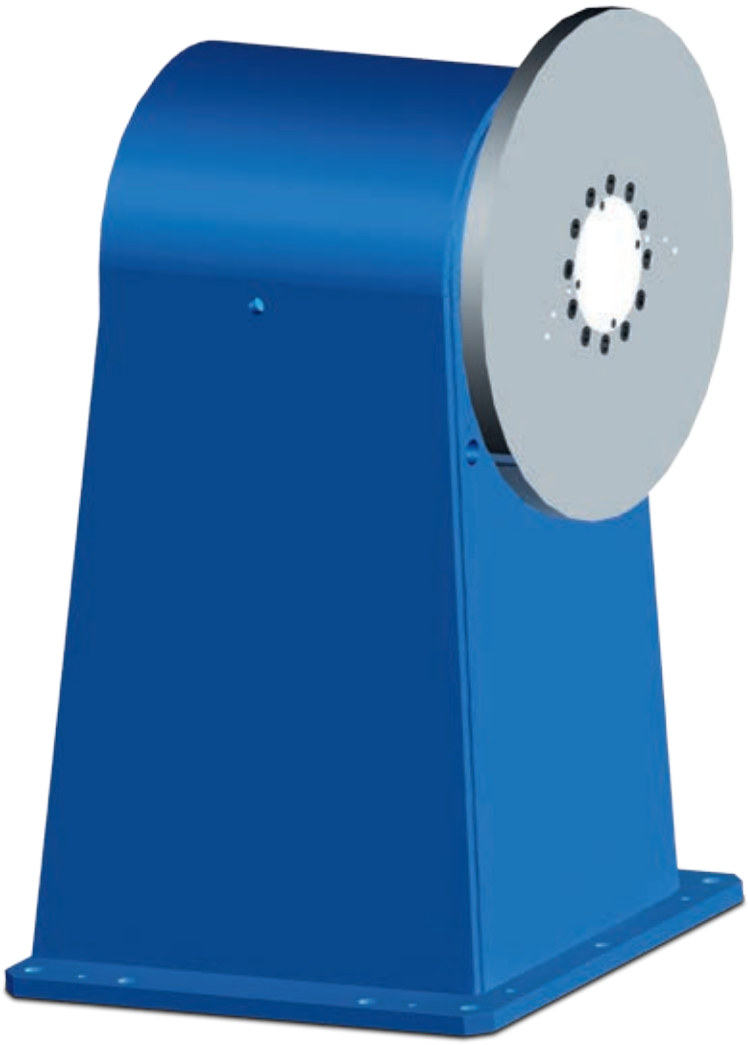

max. diameter 1200




Load position – tilt-axis
TR-1000
Load [kg]
1000
900
800
700
600
500
400
300
200
100
0
0 100 200 300 400 500 600 700 800 900 1000
Distance center of gravity to faceplate [mm]


Load position – rotation-axis
TR-1000
Load [kg]
1000
900
800
700
600
500
400
300
200
100
0
25 75 125 175 225 275 325 375 425 475 525
Distance center of gravity to rotation axis [mm]

WH-1000



1-station Positioner with horizontal Rotation Axis

The WH-1000 is a 1-station positioner with a horizontal rotation axis powered by hollow shaft drive.

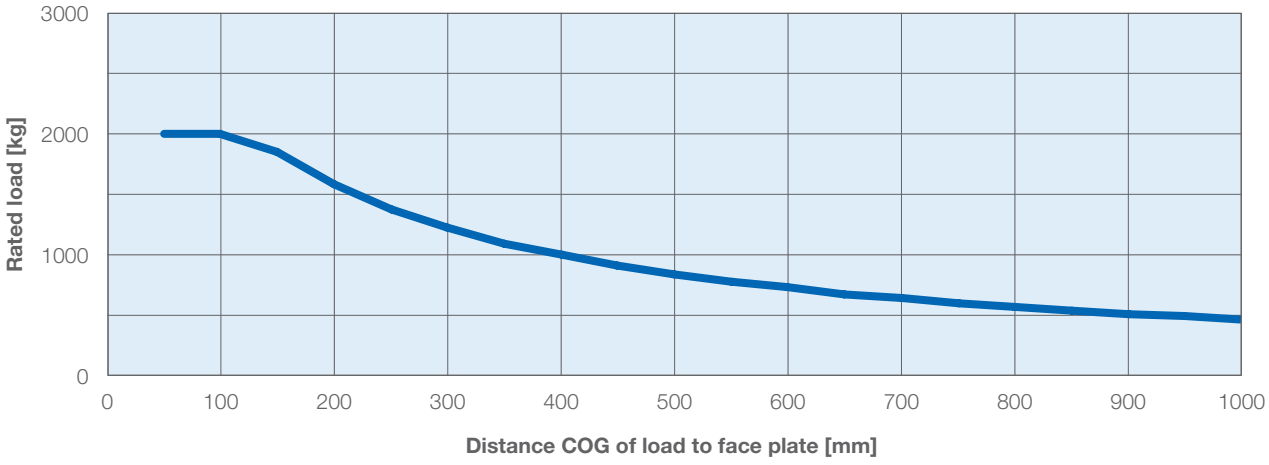
It is a stand-alone positioner which can be used with or without a tailstock (G-series) suitable for integration e.g. in compact welding stations.

In addition, a slip ring device can be used through the gear drive.

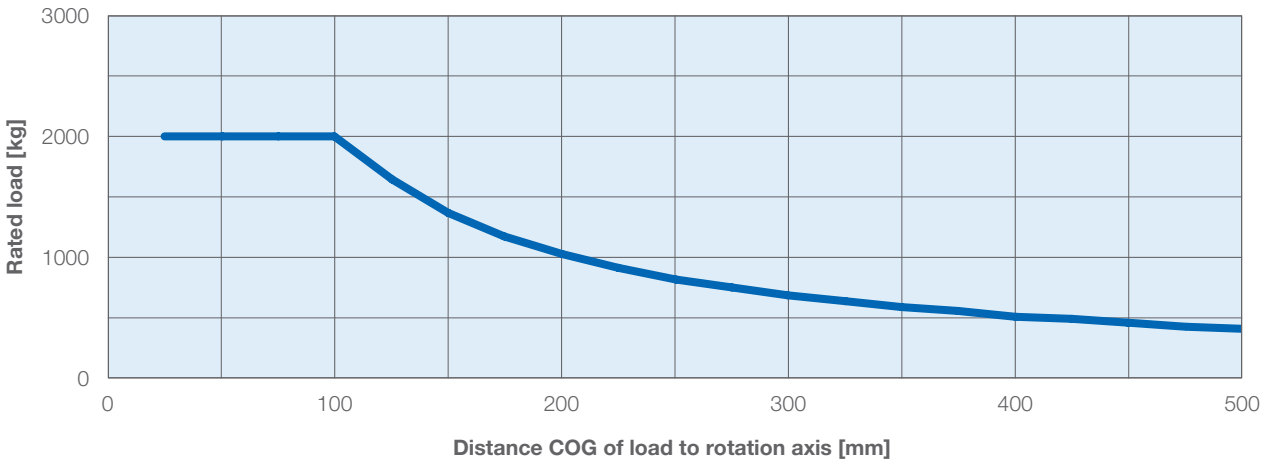
KEY BENEFITS

- High payload
- Compact design
- Combination with tailstock possible
- High reliability due to high quality components from YASKAWA

Maximum overhang of load for headstocks with HollowShaftDrives WH-1000 (without tailstock)



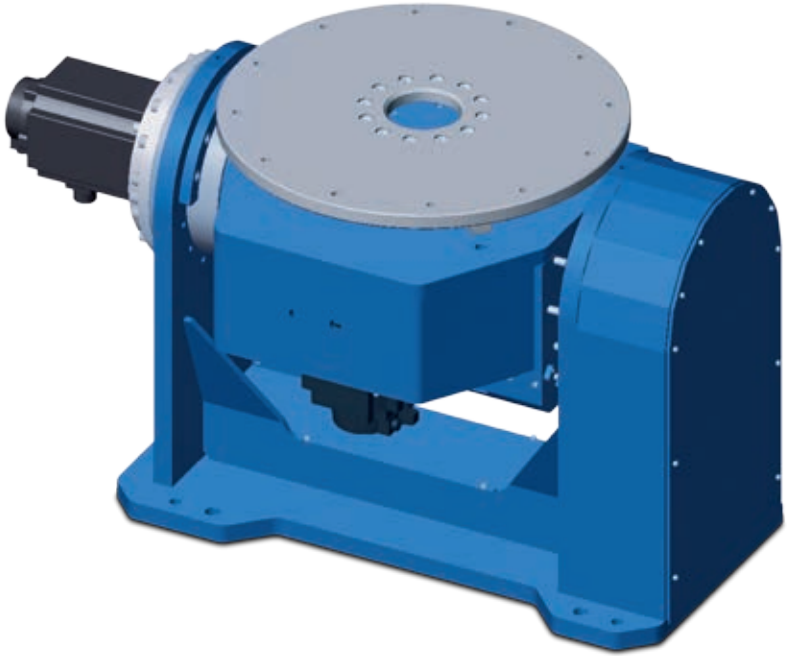
Maximum excentricity of load for headstocks with HollowShaftDrives WH-1000 (positioning mode)



Technical data	
Rated load [kg]	1000
Max. load [kg]	2000
Max. speed [°/sec.]	22.5
Rated torgue (positioning mode) [Nm]	2040
Max. inertia [kg · m²]	800
Max. load diam. (at max. inertia and rated load) [mm]	2500
Positioning time [180°/sec.]	2.5

Options
Electrical feedthroughs (16-pin, ASI bus, Profi bus, Profinet, Ethernet)
Feedthroughs for compressed air and hydraulics

DK-500 Compact



1-station Positioner with Tilting and Turning Axis

The DK-500 Compact is a 1-station positioner with a tilting and turning axis.

The ergonomic insertion height, realised by the respective panels, provides for flexible system complexes.

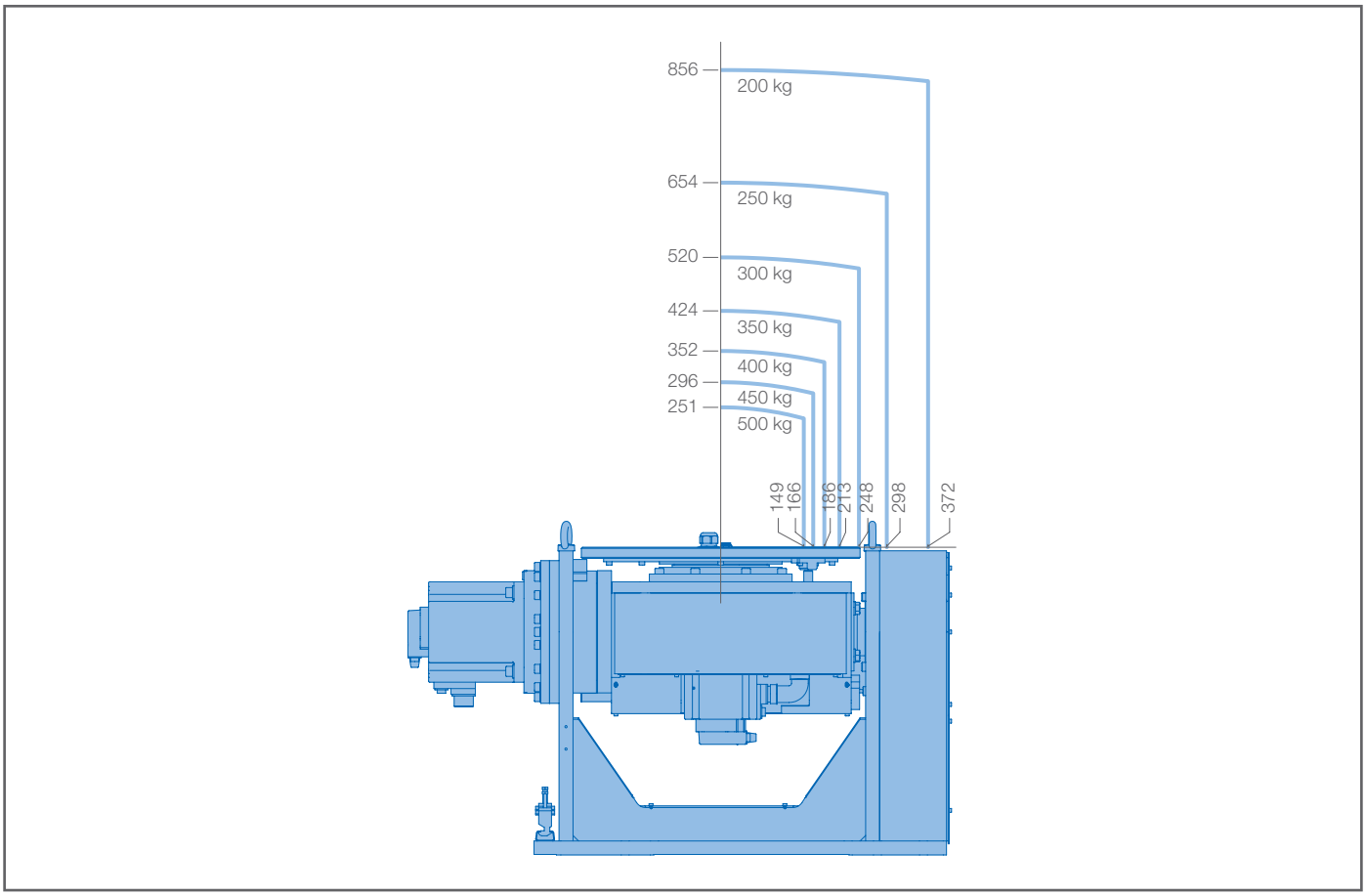
By means of the rotational axis all media, whether present or not, can be turned and rotated endlessly. Media can be placed over a hollow shaft simply to the faceplate, the turning angle is then reduced ±180°.

The maximum work piece dimension do not exceed a tilting angle of 50° and up to 120 mm, and this is reduced for larger angles to an angle of 50° over up to 1200 mm. For larger angles this is reduced to 700 mm.

As a standard the positioner has a weld rate transfer for 360A for endless turning, irrespective of the media used.

KEY BENEFITS

- Compact design
- Precise servo technology
- Simple integration of perfectly coordinated YASKAWA drives



Technical data	
Rated load [kg]	500
Height of tilt [mm]	400
Height of faceplate [mm]	552
Diameter of workpiece (*90° tilted) [mm]	1200 (700*)
Welding fuse transmitter	360

Drive unit rotary axis	
Rated torque [Nm]	730
Max. torque [Nm]	1650
Max. mass inertia [kg · m²]	101
Max. speed [°/sec.]	163
Turning angle [°]	± 180

Drive unit tilt axis	
Max. torgue [Nm]	1977
Max. speed [°/sec.]	123
Tilting angle [°]	± 135

RWV2

Compact Positioner – “Robots on Board” Welding Systems

Maximum efficiency boost – robots on board

The RWV2 compact positioners with their permanently installed welding robots enable significant savings in the welding cell in terms of space and cycle time requirements.

They are configured in such a way that they can already carry out welding during the rotational motion for changing stations, thus generating a significant improvement in cycle times.

Space requirements in the welding cell are minimized as a result of the installation

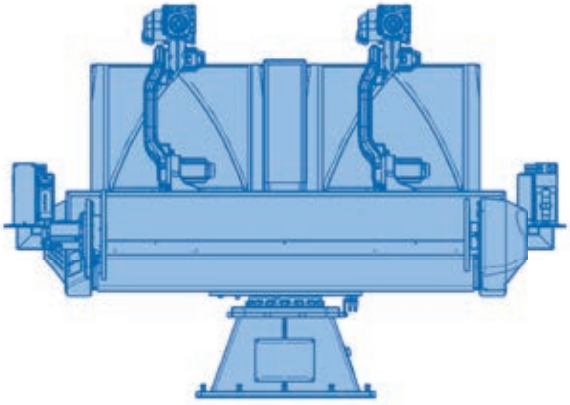
of the robots on the positioner, the position of the programmer and the loading/unloading area. Furthermore, the maintenance door is no longer required.

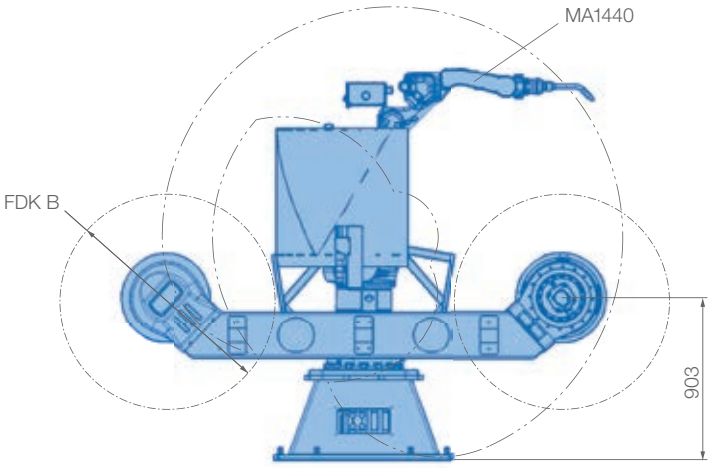
One or two welding robots from different classes of the latest robot generation can be installed at the center of the positioner table, while the payload capacity of the compact positioner can be as high as 1000 kg.

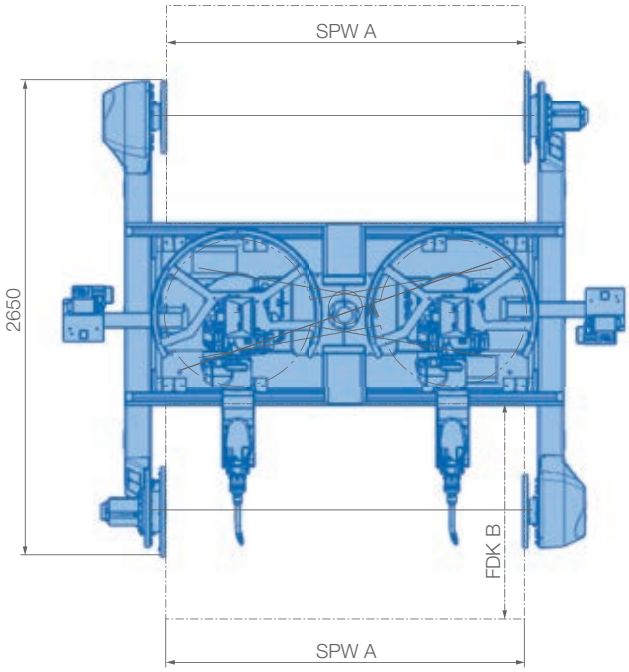
The advantages of the integrated safety controller (FSU) in the MOTOMAN DX200 robot controller can also be used (e.g. 32 safety zones).

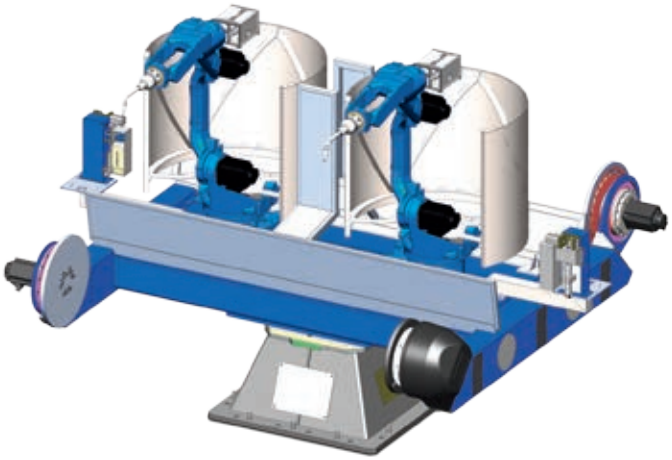
KEY BENEFITS

- Robots on board
- High-precision welding:
  - Constant position of the robot relative to the work piece and jig during rotation of the table
- Platzeinsparung bis zu 20%:
  - Space-saving design
  - Space-optimised loading and unloading
  - No maintenance door required
- Time, energy and cost savings:
  - Significant cycle time optimization by bonding during the rotational motion
  - No loss of cycle time during change of station
  - Integrated safety function (FSU) in the controller (DX200) (e.g. 32 programmable safety zones)









Technical data	RWV2-500	RWV2-1000
Rated payload [kg]	500	1000
Wide of centres A [mm]	1400 – 2800	1400 – 4000
Free turning diameter B [mm]	1200 – 1600	1200 – 1600

Rotation drive	DD-500
Rated torque [Nm]	920
Max. speed [°/sec]	170

System components
1x RWV2 Compact positioning table
2x Robots, fixed, standard models: MA1440 / MA2010 / MS80W II (more on request)

Optional components
Welding power source RL350
Weldkit WL200
DX200 integrated safety controller FSU

WL-500

1-station Positioner with two Axes

The WL-500 is a 1-station positioner with a horizontal rotary axis and an additional endlessly rotating rotary axis.

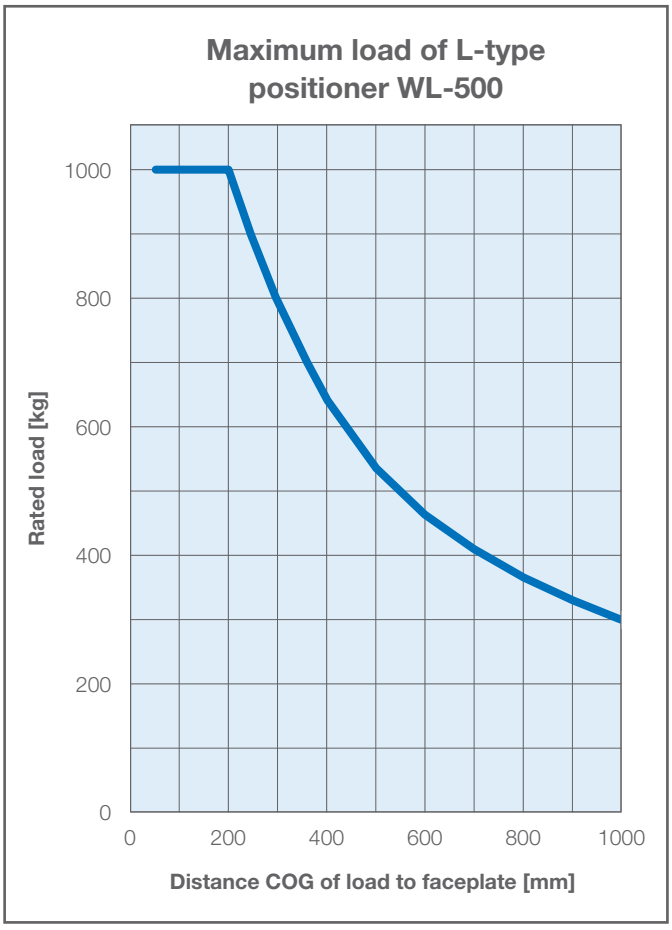
The horizontal rotary axis can have a tilting angle of ±120°.

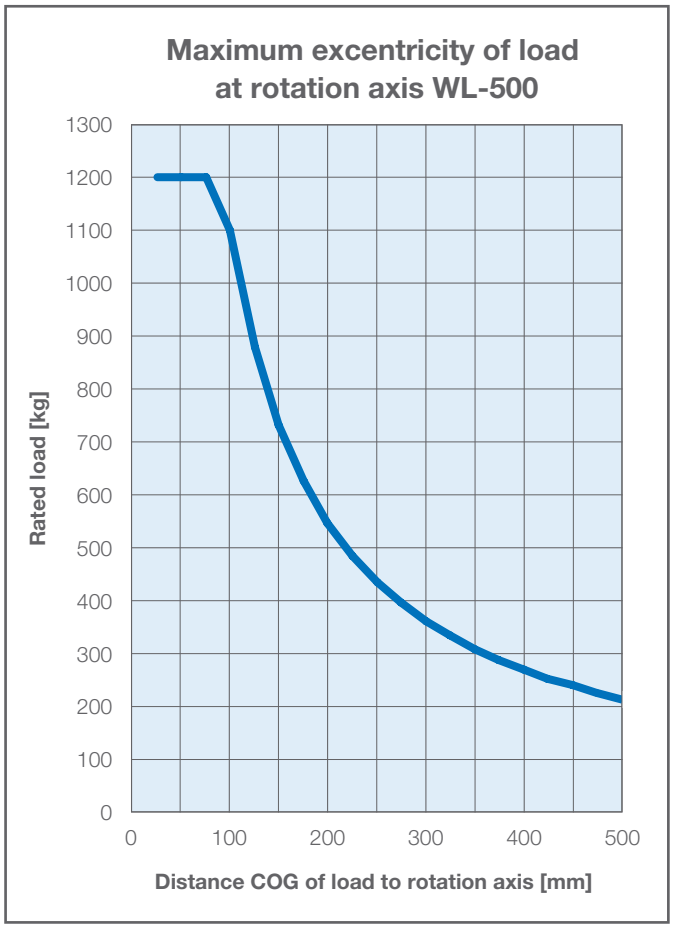
The advantage of the WL-500 positioner is that the working area of the robots remains basically in the same place when the tilt axis is being rotated.

Furthermore workpieces up to a diameter of 1600 mm can be moved.

KEY BENEFITS

- Endless rotating rotary axis
- Working area remains in the same place when tilt axis is rotated
- Large workpieces (up to 1600 mm) can be moved





Technical data	
Max. rated torque [kg]	500
Max. load [kg]	800
Load diam. Ø (standard) [mm]	1200
Max. Load diam. Ø [mm]	1600
Tilting angle (standard) [°]	± 120

Drive unit rotary axis	
Nominal torque [Nm]	1100
Max. speed [°/sec.]	163

Drive unit tilt axis	
Max. rated torque [Nm]	3490
Max. speed [°/sec.]	95

Options
Electrical feedthroughs (16-pin, ASI bus, Profi bus, Profinet, Ethernet)
Feedthroughs for compressed air and hydraulics

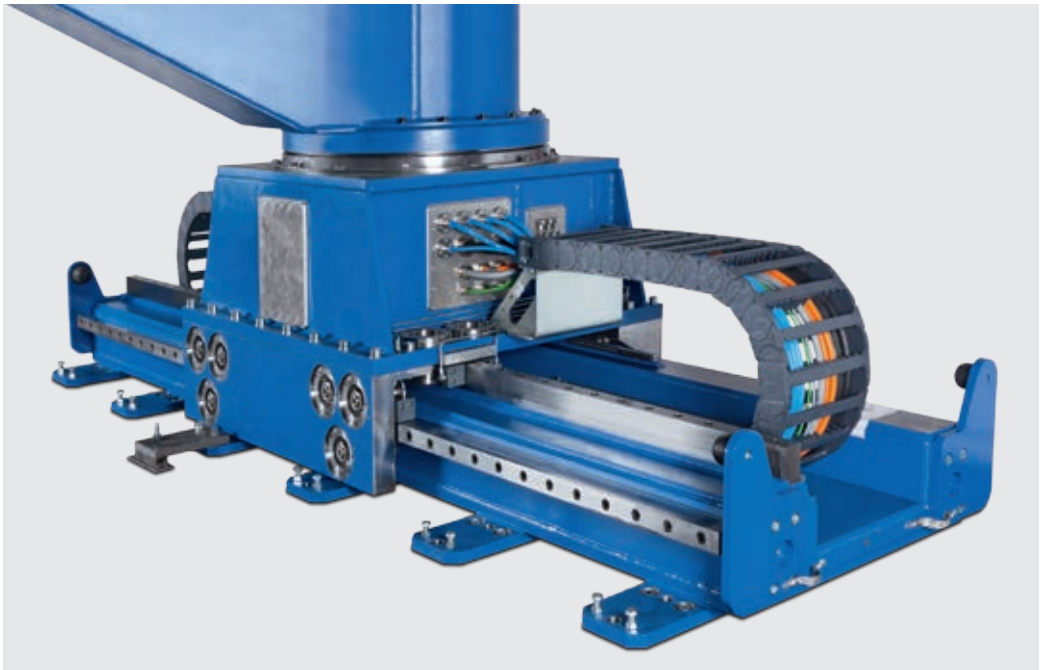
Tracks

TSL600SD/TSL1000SD/ TSL2000SD/TSL4000SD

for MOTOMAN Robots with DX200 Controller

Properties

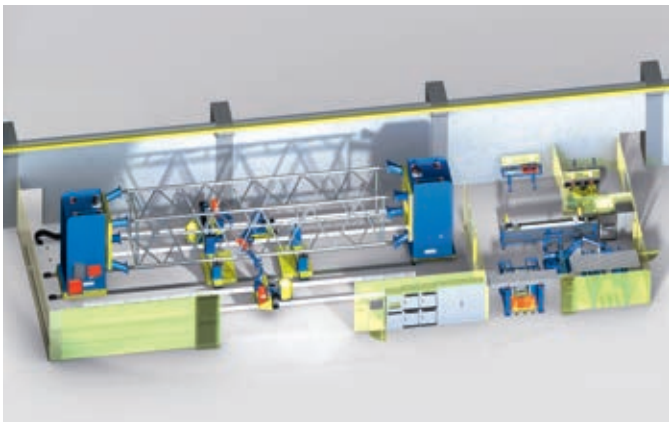
- YASKAWA TSL series tracks extend the working range of MOTOMAN robots for all robotic joining processes and handling applications as well as applications with mechanical machine tools.
- All tracks are controlled by the DX200 controller as a fully-synchronized additional robot axis. Operation and programming are carried out using the teach pendant of the robot.
- The carriage, the guide blocks and the rack drive are optimally coordinated with the robots and their applications. TSL tracks feature outstanding YASKAWA product quality and are distinguished by their flexibility, precision and performance.

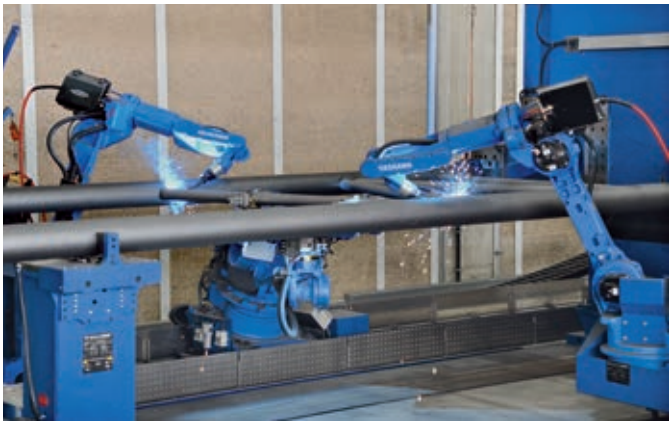


Controlled by DX200

Application Examples

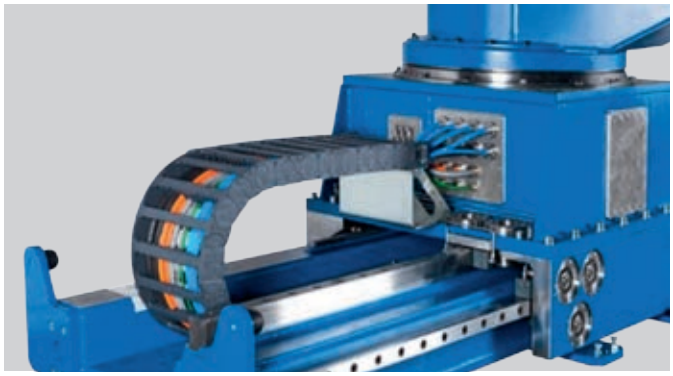
- Automated production of building crane components by means of arc welding with MOTOMAN master/slave handling and welding robot and YASKAWA TSL track as fully-integrated additional robot axis.





- Loading and unloading of presses with MOTOMAN MH180 and YASKAWA TSL2000SD track as fully-integrated robot axis.

- Linked machine loading of CNC machine tools with YASKAWA SDA10 7-axis robot and TSL track.
- Variants for special applications (painting, coating) or special dimensions are available on request.

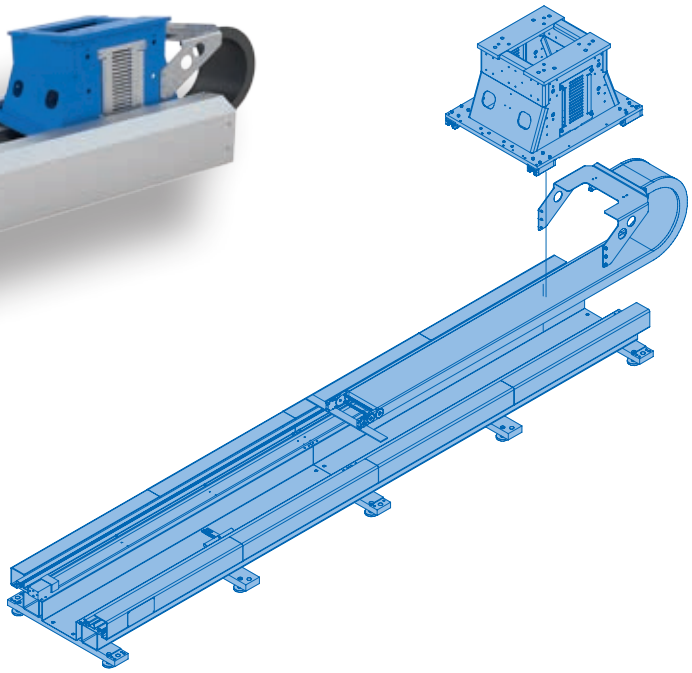


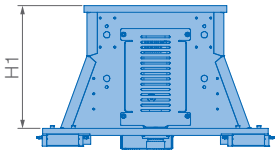
Options

- **Automatic lubricating unit**
  To minimize maintenance work and increase availability, automatic lubricating units are optionally available for the linear guides and rack drive, either separately or in combination.
- **Additional carriage**
  In order to mount a second robot, thereby increasing flexibility and performance, an additional carriage can be integrated on the track (TSL1000SD or larger).
- **Range limitation**
  For precise definition of the effective working range of the robot, range limitations can be defined for 2 or 3 zones for the TSL1000SD and 2, 3 or 4 zones for the TSL2000SD/TSL4000SD.
- **Holders for supply components**
  In order to install additional components, such as weld current controllers, wire drums or other application-specific equipment directly in the application system, various holders and mounts can optionally be provided on the carriage.
- **Cable carrier**
  The integrated cable carrier can optionally be mounted on the left or right.
- **Special applications**
  Variants for special applications (painting, coating) or special dimensions are available on request.

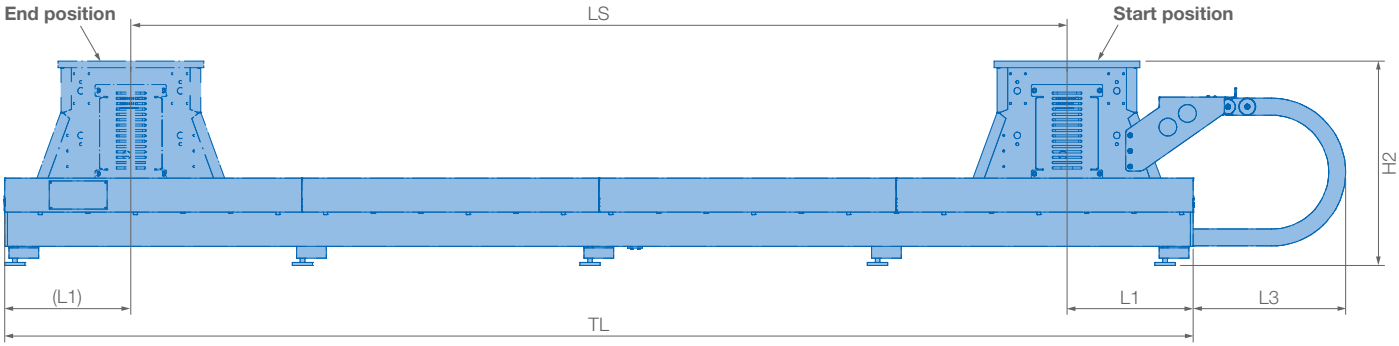
TSL600SD

- Length 2 / 3 / 4 m
- Max. Payload 600 kg
- SIGMA V drive, 1,3 kW





Carriage, type B

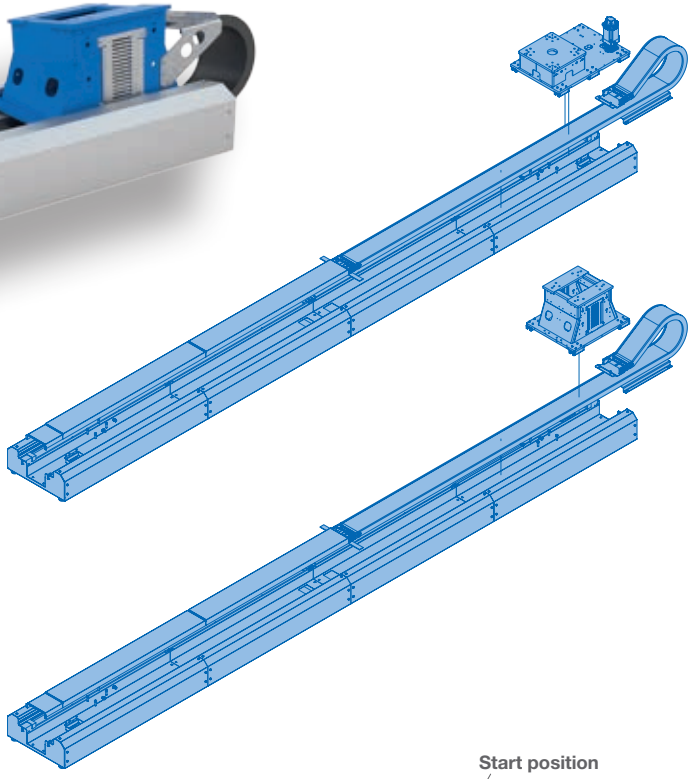


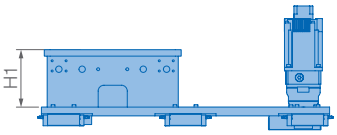
Track [m]	TSL600SD			
	TL [mm]	LS [mm]	L3 max. [mm]	Speed [m/sec.]
2	1999	1150	510	0 – 1.8
3	2999	2150	510	0 – 1.8
4	3999	3150	510	0 – 1.8

Type	Carriage			
	H1 [mm]	H2 [mm]	L1 [mm]	MOTOMAN robot DX200
B	420	H1+267	424.5	MA1440, MA2010, MH12, MH24
B	620	H1+267	424.5	
B	820	H1+267	424.5	
B	1020	H1+267	424.5	
B	1220	H1+267	424.5	
B	1420	H1+267	424.5	

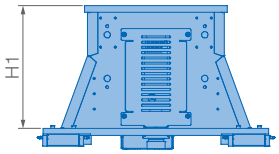
TSL1000SD

- Length 2 – 24 m
- Max. Payload 1000 kg
- SIGMA V drive, 1,3 kW

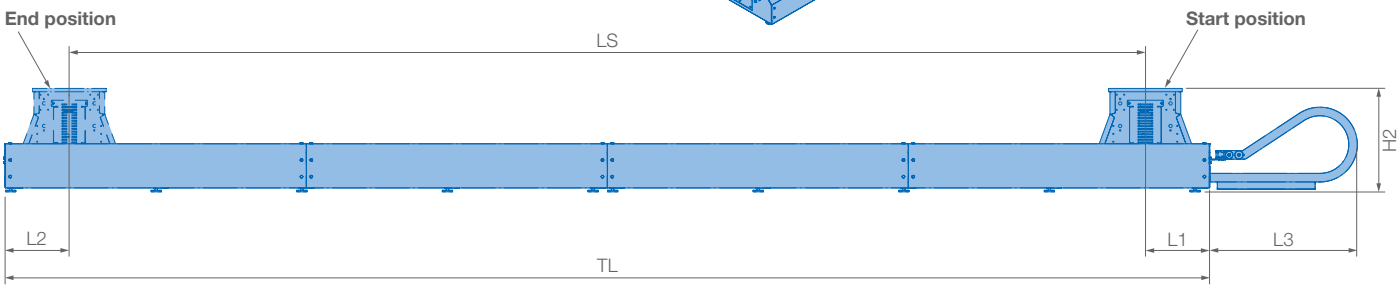




Carriage, type A



Carriage, type B

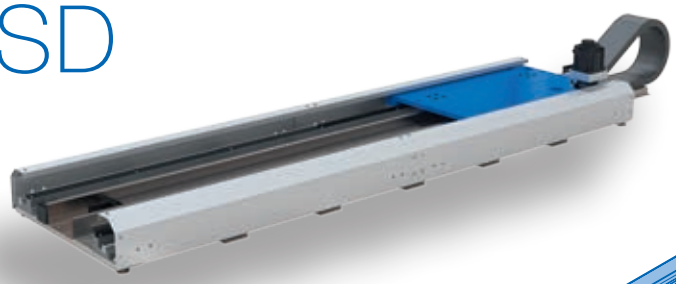


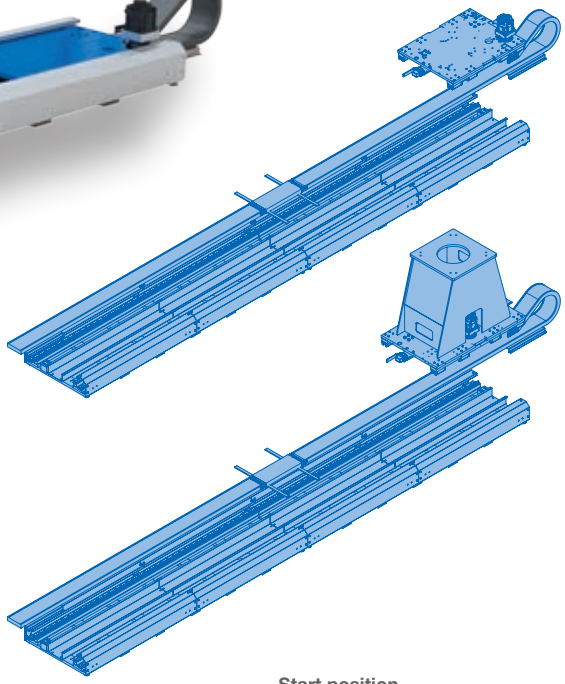
Track [m]	TSL1000SD				
	TL [mm]	LS Carriage type A [mm]	LS Carriage type B [mm]	L3 max. [mm]	Speed [m/sec.]
2	2006	935	1150	510 (660*)	0 – 1.8
4	4006	2935	3150	510 (660*)	0 – 1.8
6	6006	4935	5150	510 (660*)	0 – 1.8
8	8006	6935	7150	1003	0 – 1.8
10	10006	8935	9150	1003	0 – 1.8
12	12006	10935	11150	1003	0 – 1.8
14	14006	12935	13150	1003	0 – 1.8
16	16006	14935	15150	1003	0 – 1.8
18	18006	16935	17150	1003	0 – 1.8
20	20006	18935	19150	1003	0 – 1.8
22	22006	20935	21150	1003	0 – 1.8
24	24006	22935	23150	1003	0 – 1.8

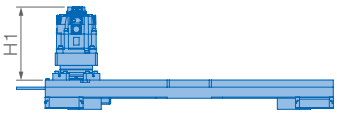
Type	Carriage			
	H1 [mm]	H2 [mm]	L1 [mm]	MOTOMAN robot DX200
A	197	H1+270	785,5	MA1440, MA2010, MH12, MH24, MH50 II, MH50-20 II, MH50-35 II, MH80II, MS80WII, MPL80II
B	420	H1+267	428	
B	620	H1+267	428	
B	820	H1+267	428	MA1440, MA2010, MH12, MH24, MH50 II, MH50-20 II, MH50-35 II
B	1020	H1+267	428	
B	1220	H1+267	428	MA1440, MA2010, MH12, MH24
B	1420	H1+267	428	

TSL2000SD

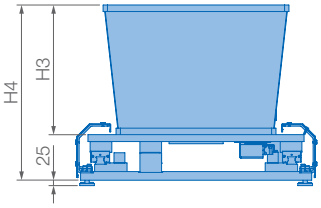
- Length 6 – 24 m
- Max. Payload 2000 kg
- SIGMA V drive, 3,0 kW



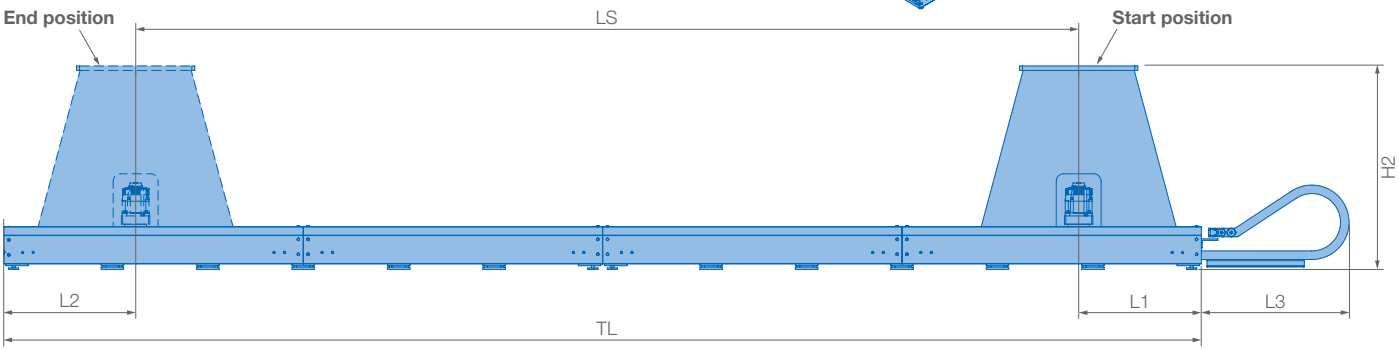




Carriage, type A



Carriage, type A with pedestal

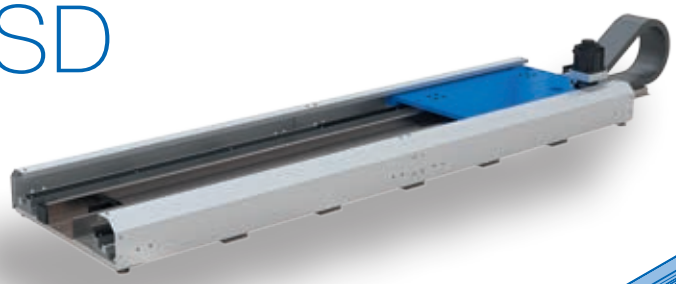


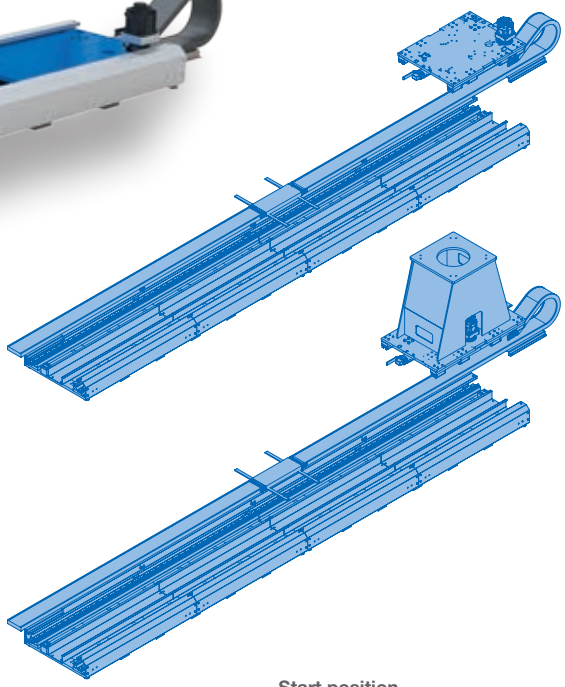
Track [m]	TSL2000SD					
	TL [mm]	LS Carriage type A [mm]	L1 max. [mm]	L2 max. [mm]	L3 max. [mm]	Speed [m/sec.]
6	6000	4660	845	495	519	0 – 1.8
8	8000	6660	845	495	994	0 – 1.8
10	10000	8660	845	495	994	0 – 1.8
12	12000	10660	845	495	994	0 – 1.8
14	14000	12660	845	495	994	0 – 1.8
16	16000	14660	845	495	994	0 – 1.8
18	18000	16660	845	495	994	0 – 1.8
20	20000	18660	845	495	994	0 – 1.8
22	22000	20660	845	495	994	0 – 1.8
24	24000	22660	845	495	994	0 – 1.8

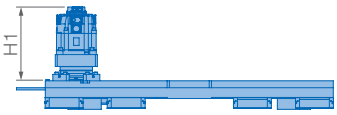
Type	Carriage				
	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	MOTOMAN robot DX200
A	330	236	–	–	MS165, MS210, MH180, MH180-120, MH225, MH280 II, MPL100 II, MPL160 II
A Pedestal 250	330	486	250	461	ES165RD II, ES200RD II, MS165, MS210, MH180, MH180-120 MH225, MH280 II, MPL100 II, MPL160 II
A Pedestal 400	330	636	400	611	
A Pedestal 600	330	836	600	811	

TSL4000SD

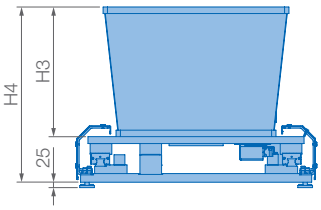
- Length 6 – 24 m
- Max. Payload 4000 kg
- SIGMA V drive, 3,7 kW



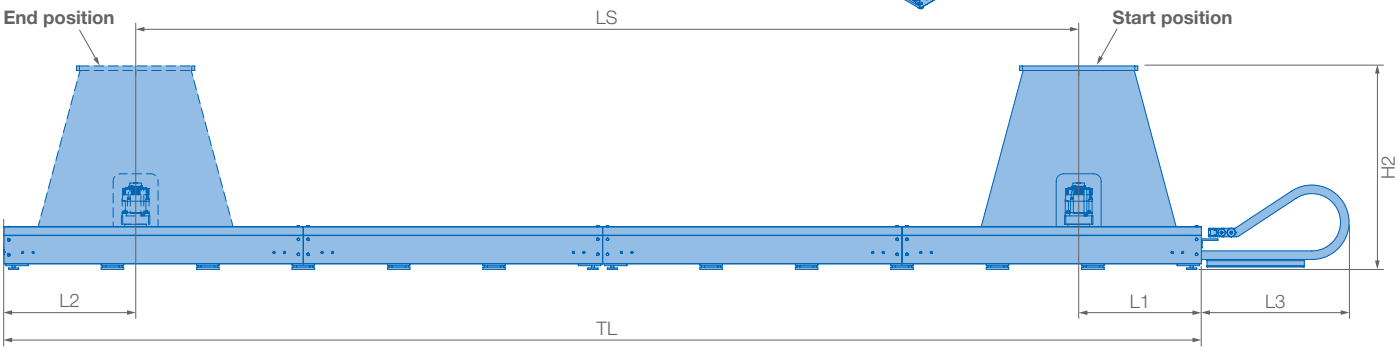




Carriage, type B



Carriage, type B with pedestal



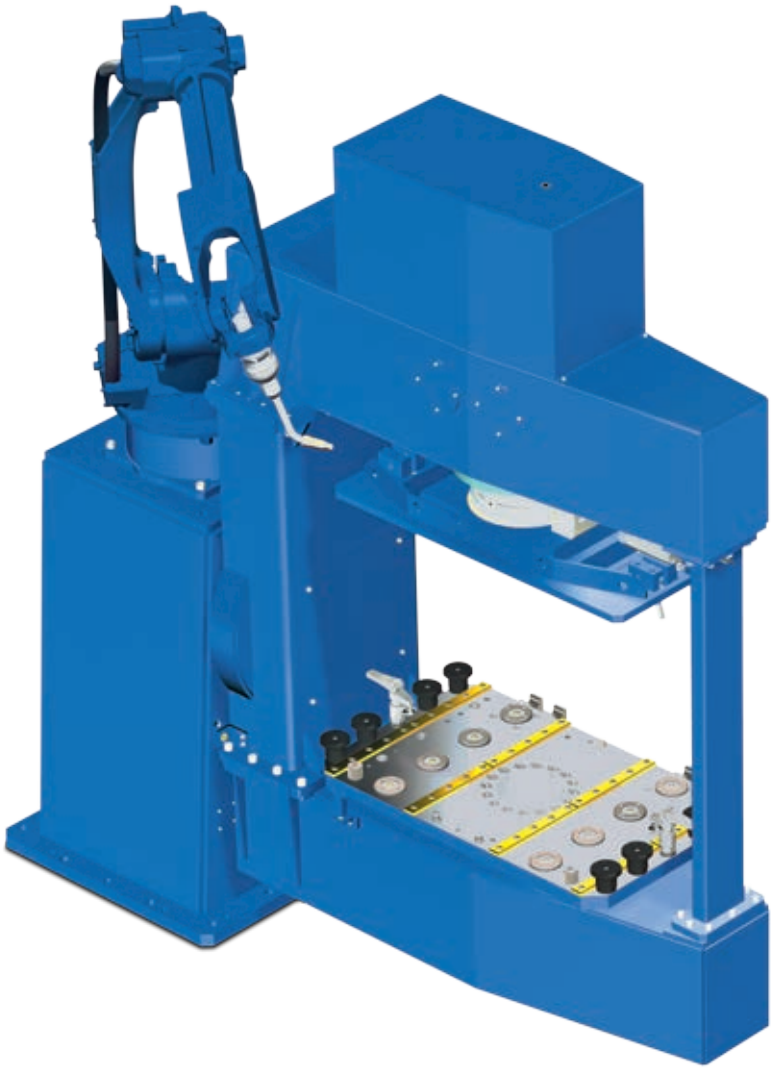
Track [m]	TSL4000SD					
	TL [mm]	LS Carriage type A [mm]	L1 max. [mm]	L2 max. [mm]	L3 max. [mm]	Speed [m/sec.]
4	4000	2660	845	495	519	0 – 1.8
6	6000	4660	845	495	519	0 – 1.8
8	8000	6660	845	495	994	0 – 1.8
10	10000	8660	845	495	994	0 – 1.8
12	12000	10660	845	495	994	0 – 1.8
14	14000	12660	845	495	994	0 – 1.8
16	16000	14660	845	495	994	0 – 1.8
18	18000	16660	845	495	994	0 – 1.8
20	20000	18660	845	495	994	0 – 1.8
22	22000	20660	845	495	994	0 – 1.8
24	24000	22660	845	495	994	0 – 1.8

Type	Carriage				
	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	MOTOMAN robot DX200
B	342	236	—	—	MS165, MS210, MH180, MH180-120, MH225, MH280 II, MH400, MH600, MPL100 II, MPL160 II, MPL300 II, MPL500 II, MPL800 II
B Pedestal 250	342	486	250	461	ES165RD II, ES200RD II, MS165, MS210, MH180, MH180-120, MH225, MH280 II, MH400, MH600, MPL100 II, MPL160 II, MPL300 II*, MPL500 II*, MPL800 II**
B Pedestal 400	342	636	400	611	
B Pedestal 600	342	836	600	811	

* Not for pedestal Type 600 ** Not for pedestal Type 400 and 600

Locking Devices

WSSE-7 & WGSH-20



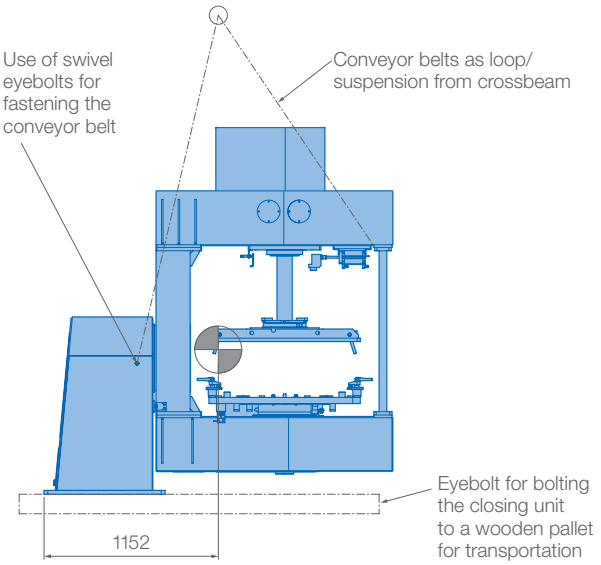
Welding hollow workpieces is often a challenge. The individual parts must be placed precisely on one another before they are processed and must be closed as tightly as possible to ensure high-quality welding.

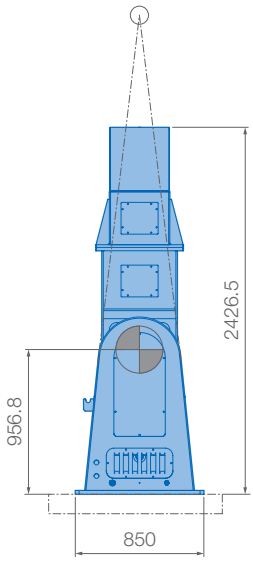
It is a well-established fact that welding robots and systems from YASKAWA guarantee high quality. It therefore makes sense only to use hydraulic locking devices that have also been designed with experience and competence. After all, a system is only ever as good as the weakest link in the value creation chain.

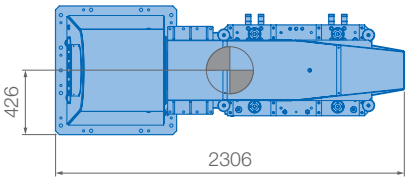
KEY BENEFITS

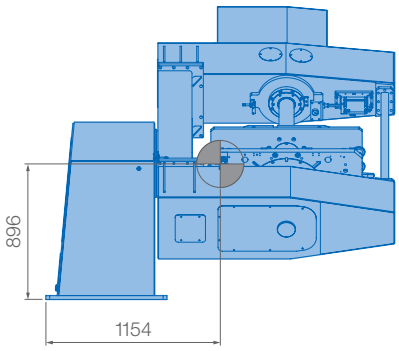
- High weld seam quality
- Optionally with electric or hydraulic drive
- Closing force and speed programmable directly in the robot controller
- Closing forces of up to 200 kN
- Various designs possible

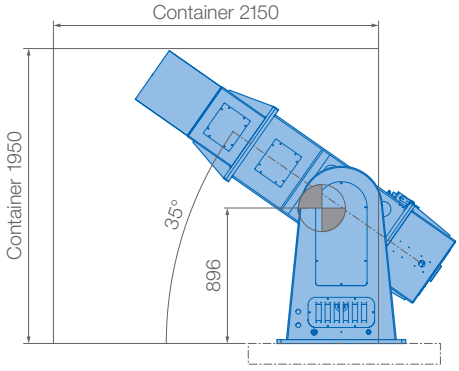
WSSE-7

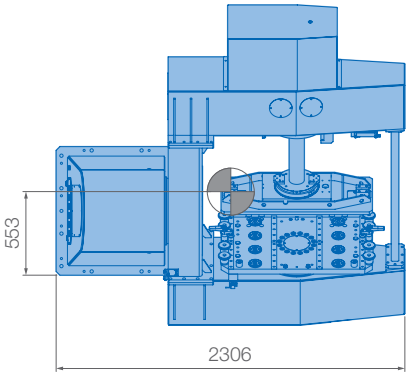




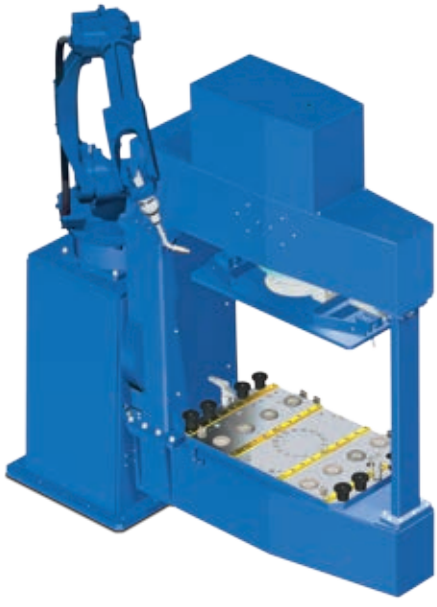




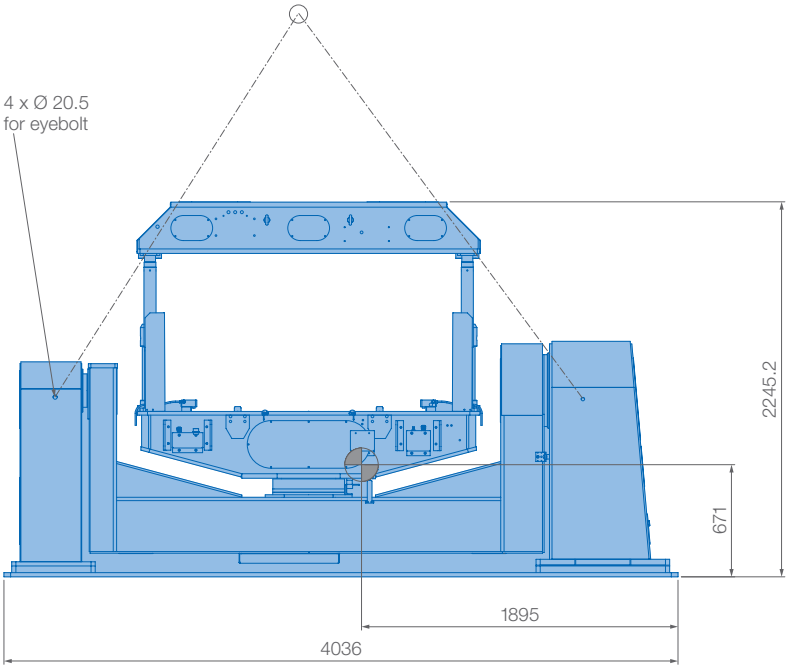


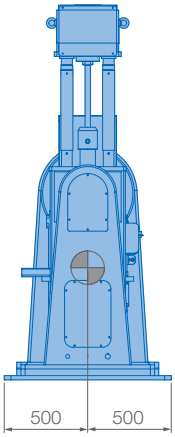


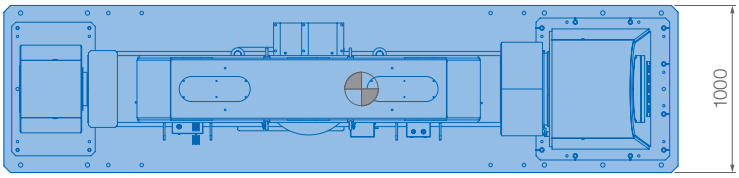
Specifications WGSH-20	
Number of stations	1
Max. closing force [kN]	70
Min. programmable closing force [kN]	15, opt. 20
Closing drive	electric
Max. hydraulic pressure [bar]	–
Max. closing speed [mm/s]	150, opt. 95
Max. jig weight [kg]	500
Max. jig length [mm]	Ø 1200
Height of jig – closed [mm]	355
Height of jig – open [mm]	755
Stroke length [mm]	400
Max. rotational speed [°/s]	135
Torque of rotational axis [Nm]	2040
Max. tilting speed [°/s]	80
Torque of tilting axis [Nm]	4420



WGSH-20







Specifications WGSH-20	
Number of stations	1
Max. closing force [kN]	200
Min. programmable closing force [kN]	80
Closing drive	hydraulic
Max. hydraulic pressure [bar]	250
Max. closing speed [mm/s]	150
Max. jig weight [kg]	1000
Max. jig length [mm]	Ø 1700
Height of jig – closed [mm]	596
Height of jig – open [mm]	946
Stroke length [mm]	350
Max. rotational speed [°/s]	95
Torque of rotational axis [Nm]	3340
Max. tilting speed [°/s]	95
Torque of tilting axis [Nm]	4420

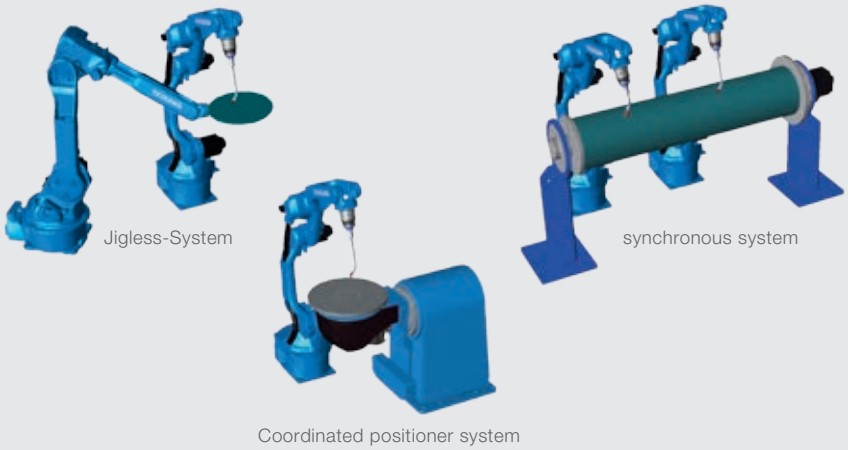
Software Tools

MOTOMAN software offers user-friendly functions in a variety of fields of application and assists you in every production phase – uncomplicatedly and efficiently.
Further information about software from YASKAWA can be found in our software brochure.

Examples:

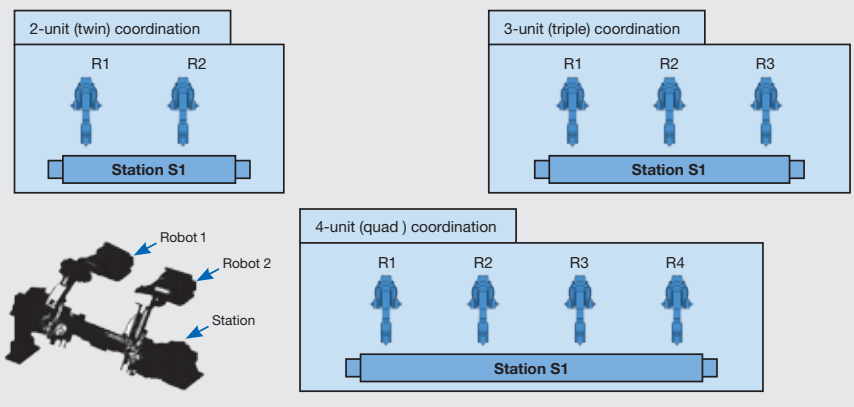
Software Functions

Coordinated Motion



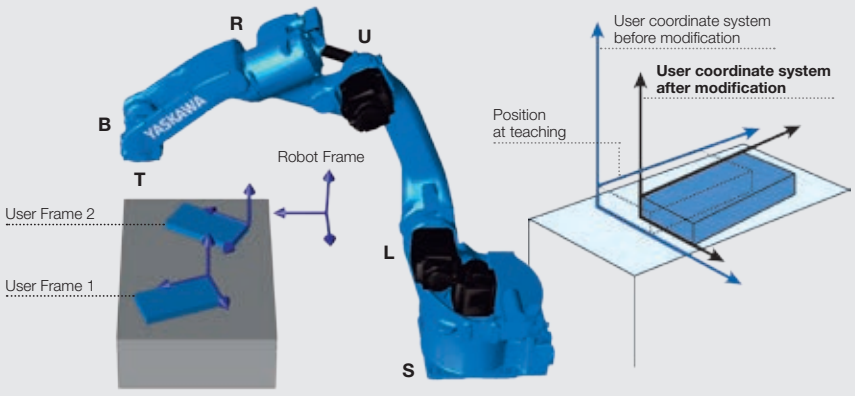
The current controller generation for DX200 is able to manage and control up to 8 robots plus 24 external axis.

Station twin/triple/quad



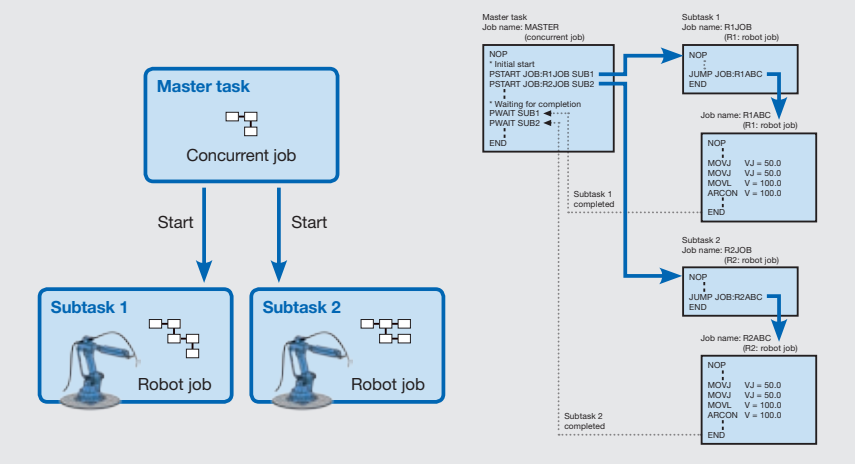
YASKAWA systems can operate simultaneously and fully synchronized with 2 (Twin), 3 (Triple) or 4 (Quad) robots at one rotation axis.

Relative Job



Robots usually store their taught positions in (“standard”) pulse jobs where encoder data for each axis are registered. The relative job function offers the possibility to store all positions as xyz data “in relation” to any cartesian coordinate system, like user frame, base frame etc. Relative jobs can be generated when new job will be created or later on by conversion of existing standard job.

Independent Control



DX controllers can manage up to 8 robots plus 24 external axis. The “independent control function” allows to execute several programmes with different axis group combinations at the same time.

Macro Command

Example of macro instruction registry: SEALON

Line Step

000 NOP
001 MOVJ VJ 100.0
002 WAIT IN#(1) ON
003 MOVJ VJ 50.0
004 SEALON WIDTH=8
005 MOVL V=125
006 MOVL V=95

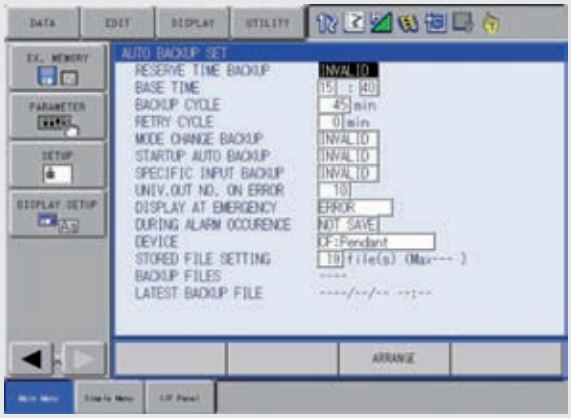
Example of macro job registry: SEALON

Line Step

000 NOP
001 GETARG LI000 IARG#(1) : Store 1st argument data ‘8’ to LI000.
002 DOUT OT#(10) ON : Turn ON general output 10.
003 MUL LI000 10 : Multiply the number of LI000 by 10. 8×10 80
004 WAIT N#(10) ON : Wait for general input 10 to be ON.
005 AOUT AO#(1) LI000 : Output ‘80’ to the analog output 1.
006 END

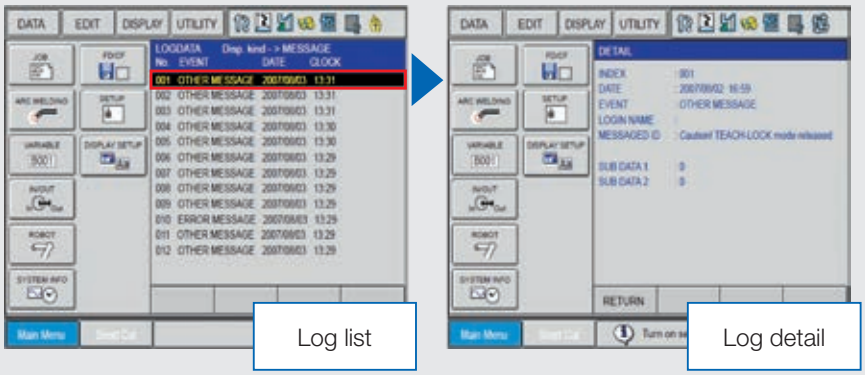
Makro programming enables the summary of recurring command chains and instructions. Variable parameters of this command chain are transferred by arguments in the macro command.

Automatic Backup Function



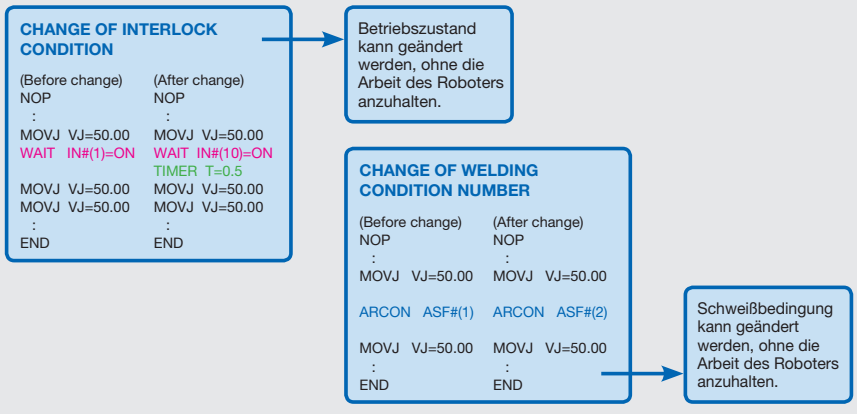
At regular intervals the automatic backup function creates a backup file containing all current controller data. In case of unexpected problems the latest controller state can be restored at any time.

Logging Function



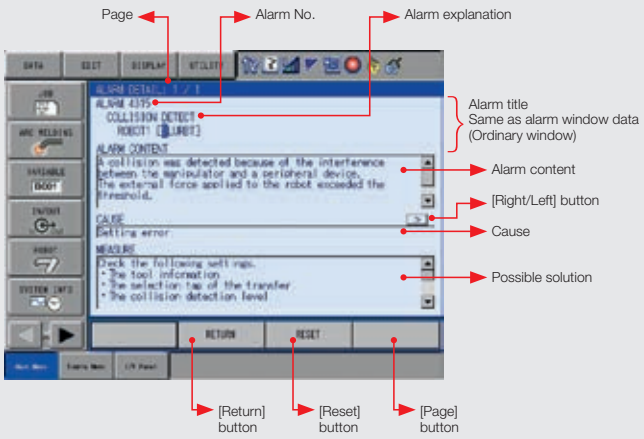
During operation all relevant events (p.e. job changings or switching the operating mode) are registered and can be displayed for diagnostic purposes.

Job Editing during Play



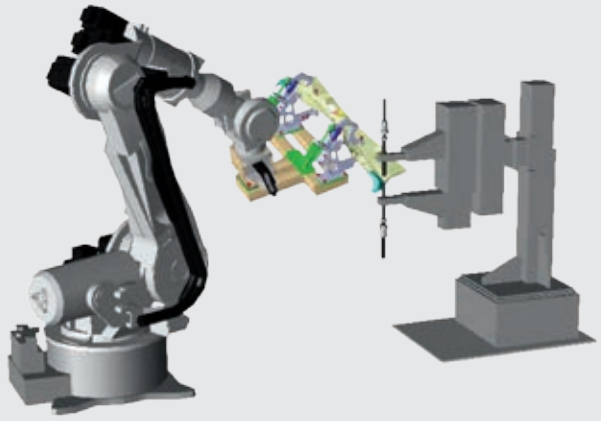
This function enables editing of programmes during automatic operation.

Alarm Detail Displaying



This function simplifies specific diagnostic and fixing of occuring alarms, which are sorted by frequency. Contents, causes and recommendations for fixing the alarms are displayed.

External Reference Point



Any application where handling robot must manipulate work piece with devices like press brake, stationary torch or spot gun (left picture) requires this function: it enables the creation of an external TCP in addition to tool centre point of robot. Interpolated movements around this external TCP will be possible now.

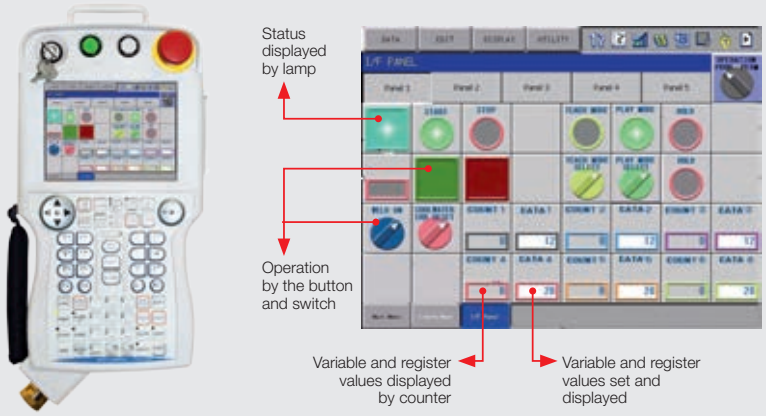
Manual Brake Release

The manual brake release function allows specific brake release by programming pendant for each servo motor in the system: Robot axis as well as external axis.

Teaching Point Adjustment

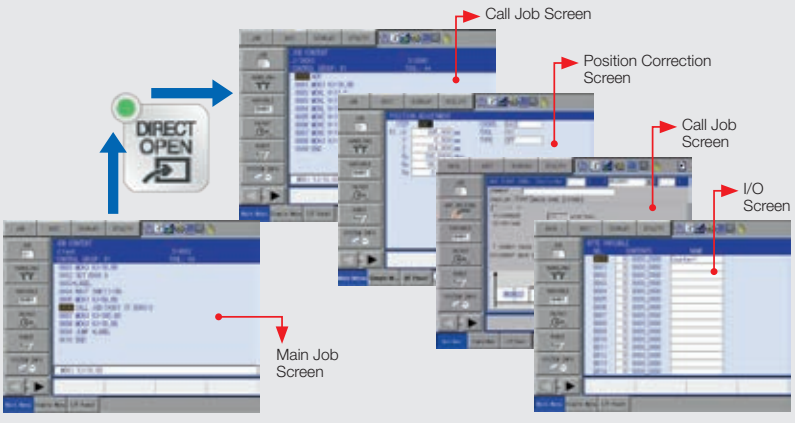
The “teaching point adjustment function” modifies the taught positions by using the numeric keys on the programming pendant without operating the manipulator (offline editing).

Interface Panel (IF Panel)



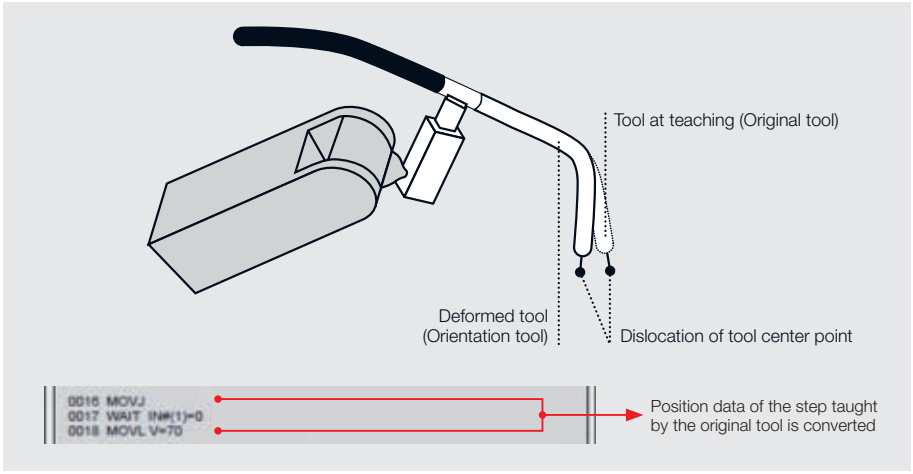
The IF panel enables the possibilty to set up a virtual operation panel within the programming pendant. Frequently used switches, variables or status indicators can be individually arranged and clearly displayed. An existing IF panel which has been set up once can be copied to other controller by uploading configuration file.

Numerical Input Screen Display with Direct Open



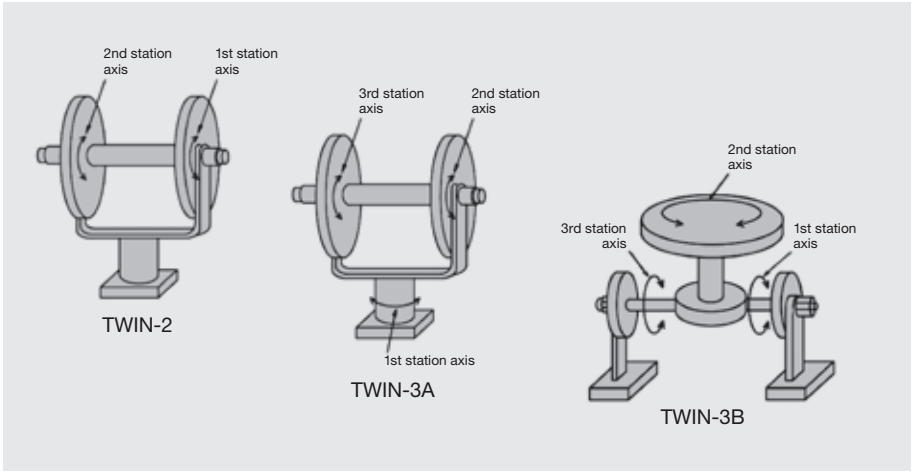
The “direct open” button enables direct access to additional information for each instruction line where they are available: For example job contents in CALL JOB instruction, detailed display of welding or weaving files, input/output screen etc.

PMT



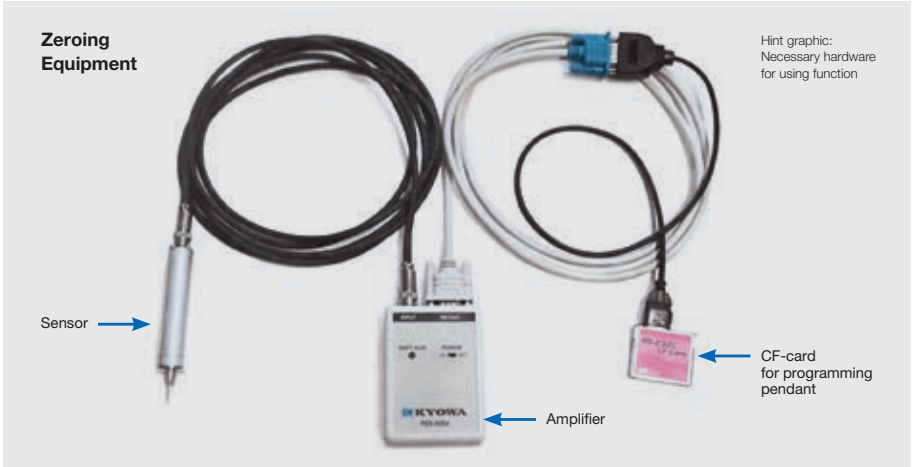
This “mini” program inside the controller converts robot programs to another tool. This would be required for example in case of using another kind of torch with a different tool-centre-point as the original torch for which the program was created.

Twin Drive



With this function several external axes can be interconnected to one unit. This unit can be managed and programmed similar like one station or base, even though several motors have to be driven and controlled.
The common application are turning axes with driven counter-bearings.

Zeroing Robot and external Axis

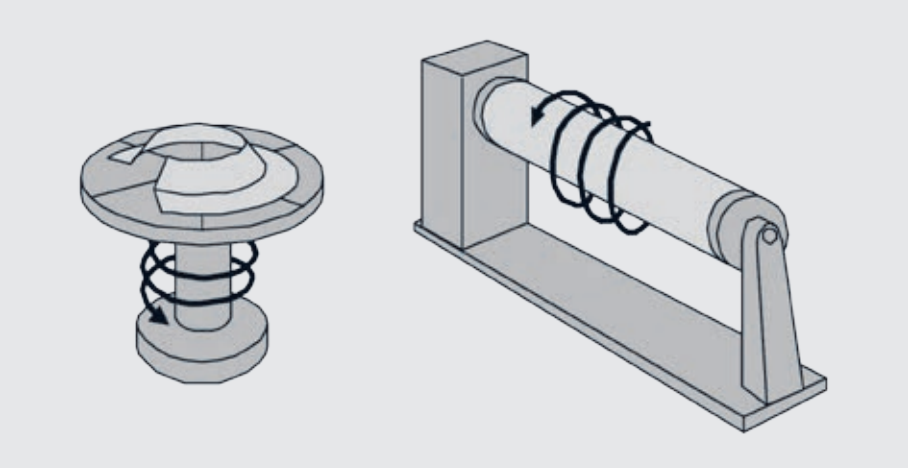


With the zeroing sensor it is possible to quickly restore the home position (absolute data) from your robot or external axis, for example after loss of absolute data.

T-axis endless

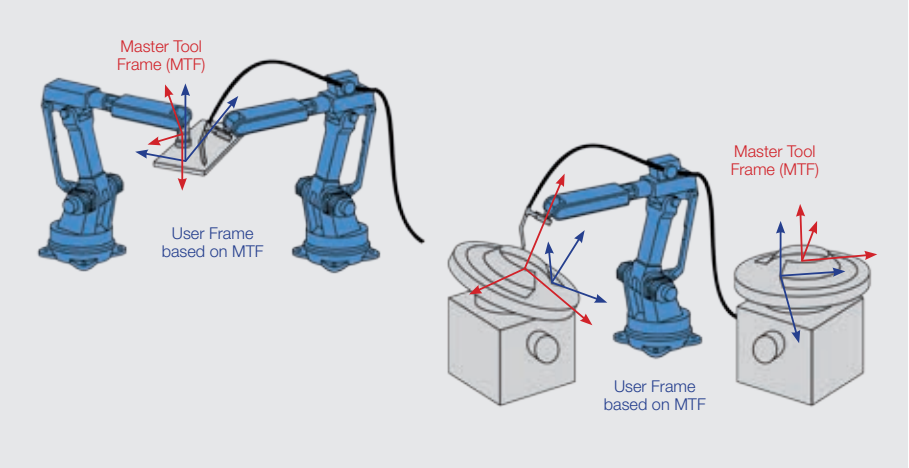
This function continuously rotates the T-axis a plural number of turns. Although the rotation angle of the T-axis is generally limited within ±360 degrees, this function allows it to rotate endlessly.

External Axis endless



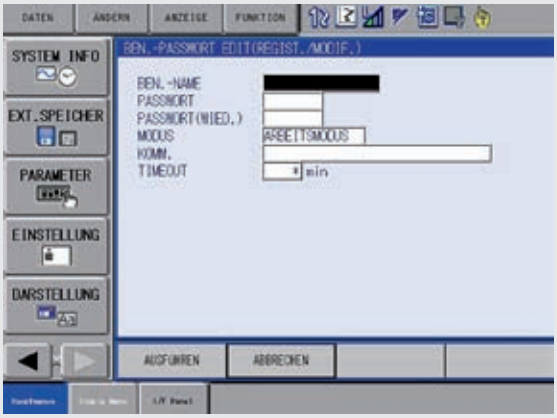
This function continuously rotates the external axis a plural number of turns. Although the rotation angle of the external axis is generally limited within ±360 degrees, this function allows it to rotate endlessly.

Master Tool User Frame



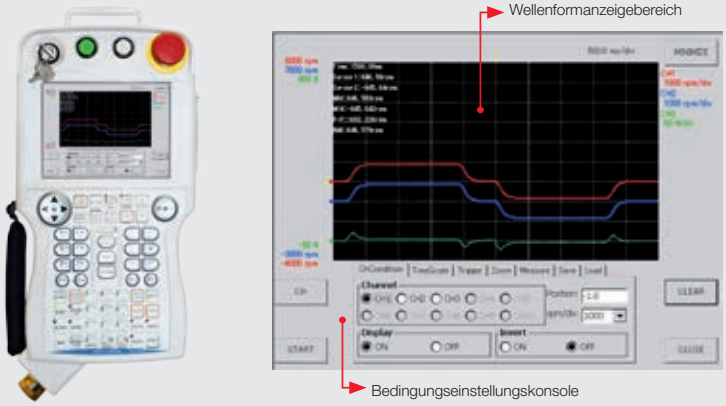
The “Master Tool User Frame” is a special function for jigless systems and coordinated motion systems.
This type of user coordinate system is related to master tool frame of “master” robot or station axis.

Password Protection



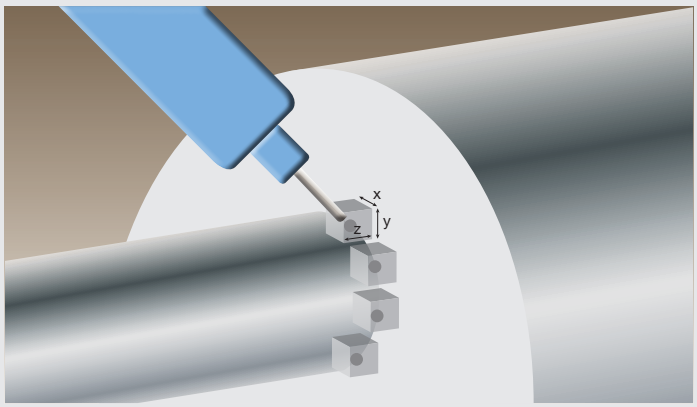
The password protection function helps assure system safety by requiring each user to have a personal authorization registered
to access the controller so as to control what operations may be performed by the users.
The system administrator authorizes each user by assigning a login name and password, a security level and a timeout setting, thereby allowing a specific level of controller access.

Pendant Oscilloscope



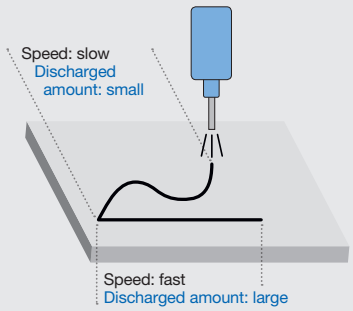
The Pendant Oscilloscope Function is a monitoring function for visualizing the speed and torque of each robot axis and the status of concurrent I/O signals on the Programming Pendant.

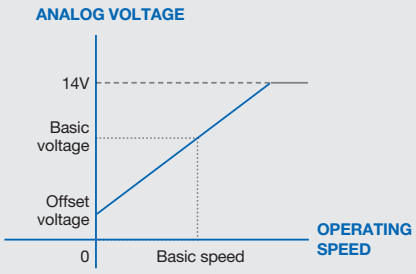
Safety Re-teach



This function minimizes unintended or not authorized re-teaching.
Existing program steps can just be re-teached in previously defined limits.

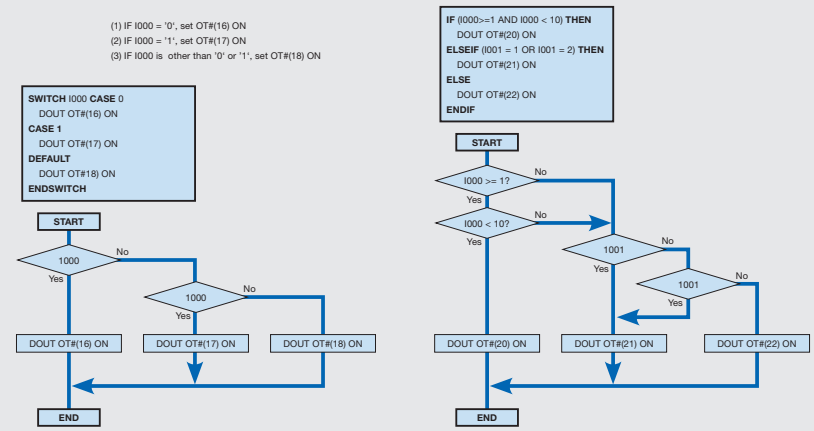
Analog Output Function corresponding to Speed





This online-function generates an analogue voltage during the process. Its height is related to robot's real speed. Resolution and pitch of this characteristic are configurable. Common applications you will find in control of bonding or sealing guns. But it can be also used for arc welding, when parameter must be adapted according to "heat input per unit length of weld".

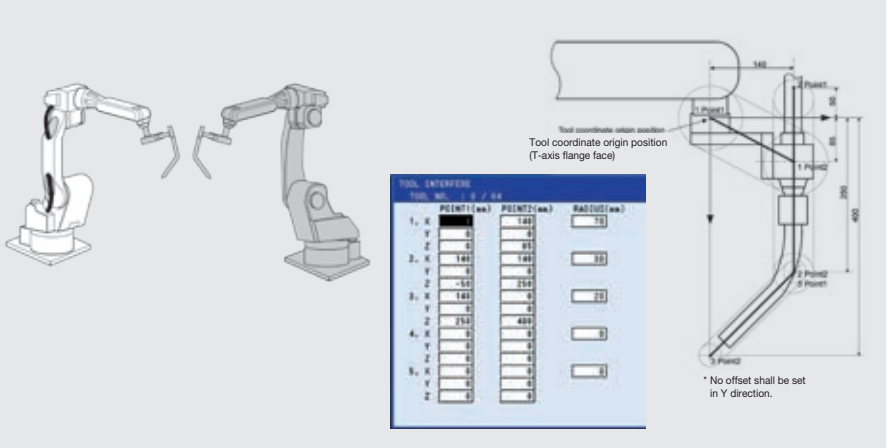
Structured Language



With the Structured language function it is possible to create clearly arranged programmes based on high level language with the following instructions:

- IFTHEN-ELSEIF-ELSE-ENDIF
- WHILE-ENDWHILE
- FOR-NEXT
- SWITCH-CASE-ENDSWITCH

Arm Interference Check

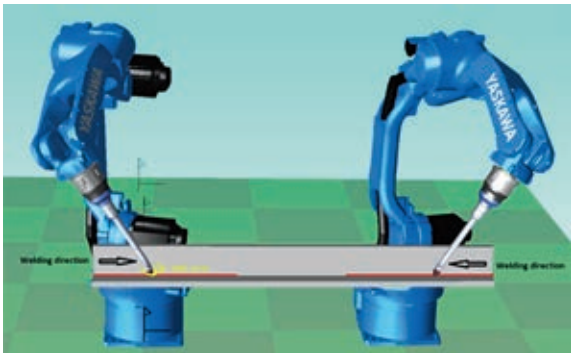


This function checks the interference among manipulator arms and tools in the system consisting of one controller and multiple manipulators.

Error Recovery – the “Error Doctor”

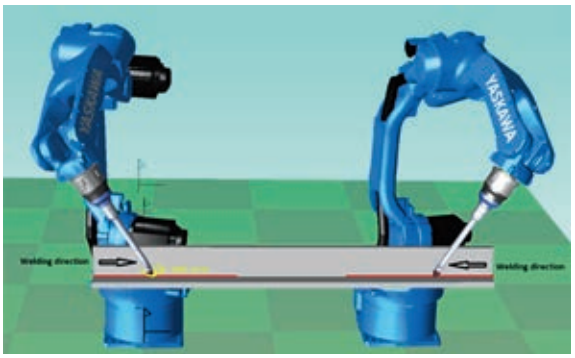
Software for DX200 Multi-Robot cells: defined detection, treatment and reworking of errors that can occur during the simultaneous execution of multiple processes.

NEW



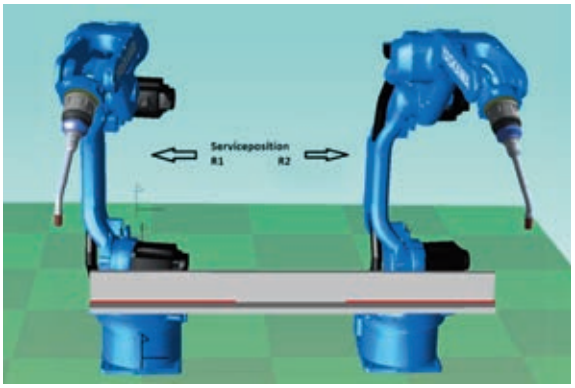
Without Error Recovery:

Two arcs at the same time:
Only the left-hand robot has a fault, but both robots are stopped! The cause of the error is eliminated (manually) and both robots can be restarted at the position of the interruption.



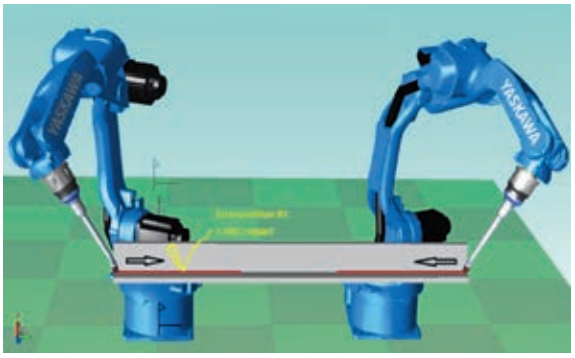
With Error Recovery:

The left-hand robot has a fault, but no alarm is triggered; instead, merely the position of the fault is saved. The right-hand robot can complete its welding operation without an interruption, while the left-hand robot continues its path without an arc.



Once a fault has been detected, both robots move to a freely programmable service position.

The cause of the error can be eliminated by operators and the program is restarted.



Both robots repeat their program range. At the saved error position, the interrupted robot carries out ignition and can complete the missing weld seam.

An overlap distance for the new run at the seam can be set.

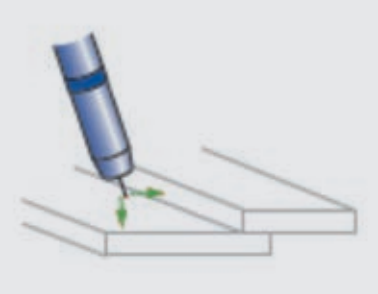
Sensors

Not one Sensor to cover all Eventualities ...

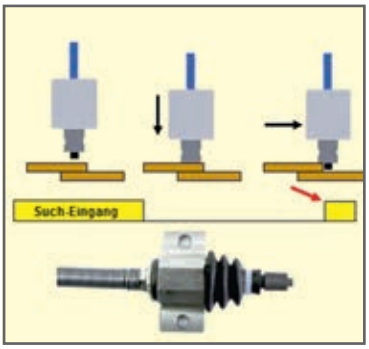
We offer a wide range of sensors, both our own and standard commercial products, covering all different sensor applications. By coordinating the software functions of our controllers with the specific sensor type, we are ideally placed to offer the right tool for every application scenario. Our Application Technology department will be happy to advise you on all aspects of sensor systems, no matter how tricky the application.

... but the “right” Sensor for every Task!

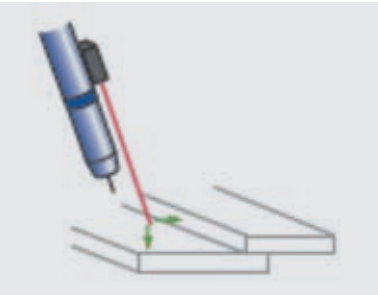
Tactile Sensors



Simplest, but most inexpensive and service-proven method of static component measurement, e.g. search for start point: using search runs until component contact is achieved, differences between the original component and the current component can be detected and program points shifted accordingly. Switching contact is carried out by means of an electric short circuit (search voltage on wire or gas nozzle) or mechanical sensor.

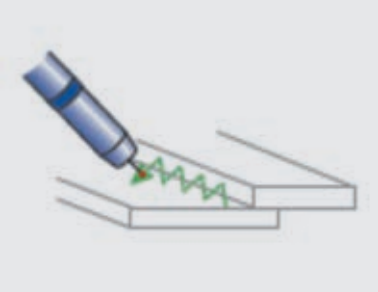


AccuFast

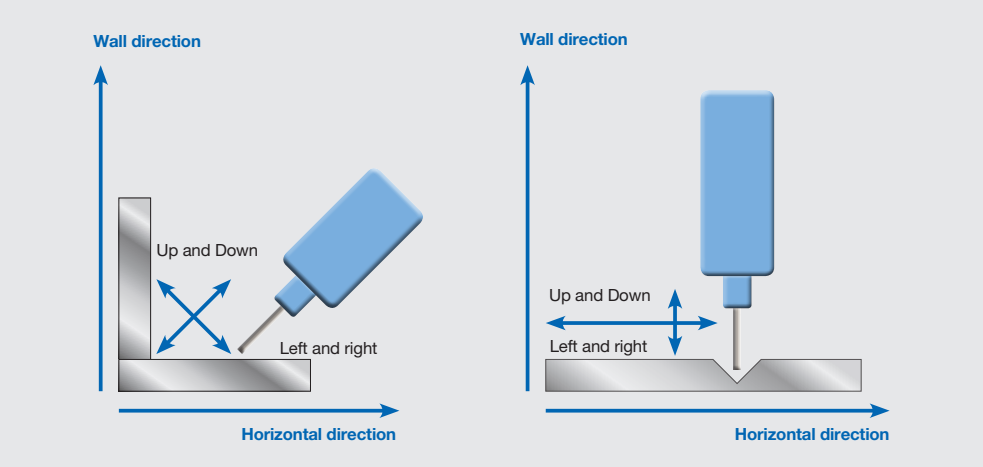


YASKAWA product: one-dimensional laser, diffuse reflective sensors, search routines such as those described above, but non-contact. Steps on the component are detected by means of the surge in intensity of the reflected laser beam.

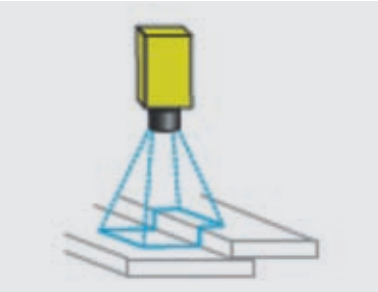
COMARC Arc Sensor



Seam tracking system that uses a shunt to detect the changes in current strength in the arc as the length of free wire changes during weaving. The resulting differences from the taught values for this seam form the basis for a correction of the welding path. Unlike with “static” measurement, it is possible in this case to respond to discrepancies that arise during the process as a result of shrinkage and distortion.



MotoSight2d Interface



MotoSight2D is a fully-integrated hardware/software package for the 2D view. It enables the robot controller to communicate with the Cognex In-Sight sensor devices. MotoSight2D includes a teach pendant application that is used for the direct assignment of supported visualization device results to robot variables for use in robot programs. Recorded images and visualization graphics appear directly on the display screen of the teach pendant.

MOTOEyeLT

Lasertracking

The MOTOEyeLT software allows seam tracking and seam optimisation in real time.

For this purpose, the robot is equipped with a laser camera (preceding the tool) from different manufacturers.

Via the rapid Ethernet connection, the MOTOEyeLT software controls the communication between the components.

In order to achieve optimal welding results, the information from the camera is then processed by the software, allowing necessary adaptations of the robot path, robot velocity as well as process parameters.

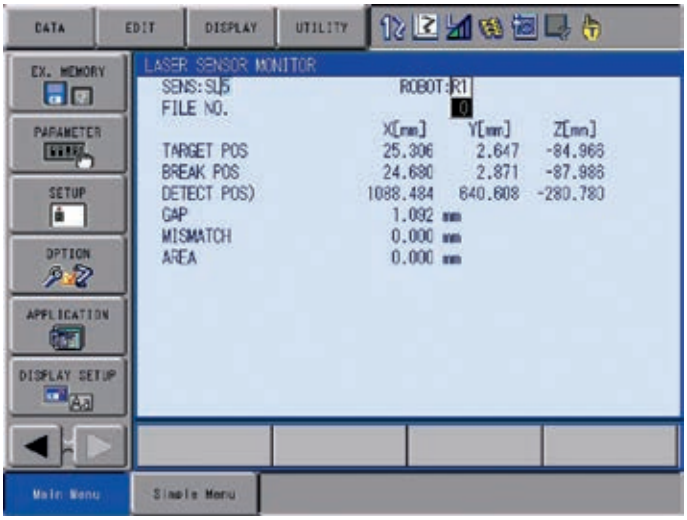
Thanks to preconfigured macros programming is very simple. Moreover, the 40 files for the individual adjustment of the tracking parameters make system configuration easier.

Additional advantages of MOTOEyeLT are the easy calibration with the sensor to the TCP as well as the use of Standard CIO programs (for digital and analogue power source control).

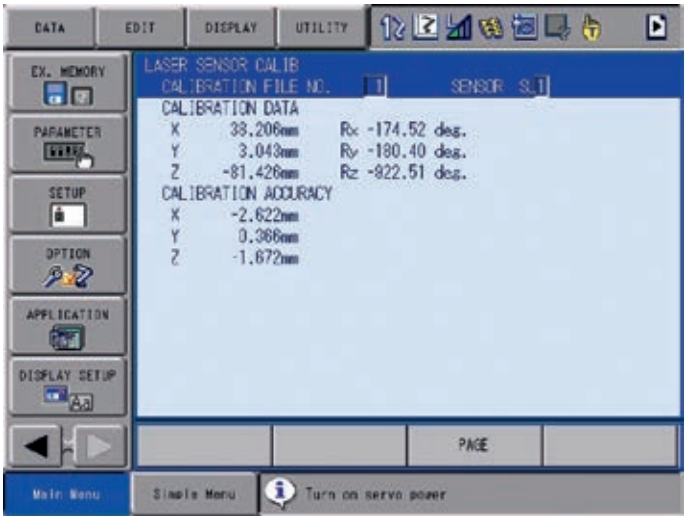
Restriction: If it is necessary/mandatory to adapt process parameters online, the analog output card (YEW) is required and it must be possible to control the power source using reference voltages.

KEY BENEFITS

- Start and target point search
- Adaptive welding – adaptation of e. g. robot velocity and wire position
- Support of seam tracking sensors from different manufacturers
- Reduction of reworks
- Increased number of faultless work pieces
- Increased cost-effectiveness
- Simple programming with preconfigured macros
- Synchronous tracking with external and/or base axes
- Path record and path play/backplay function
- Simple calibration of the sensor with the TCP
- Use of Standard CIO programs (for digital and analogue power source control)

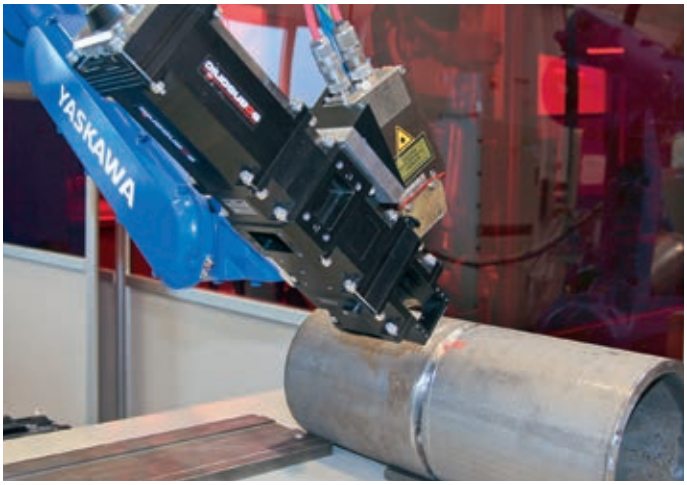


Lasersensor monitor



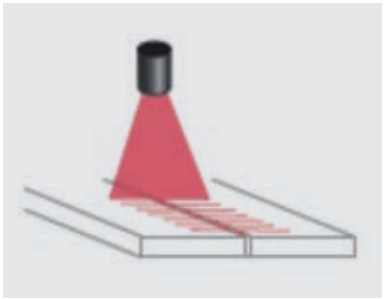
Monitor Lasersensor calibration

Seamtracking with MIG/MAG torch



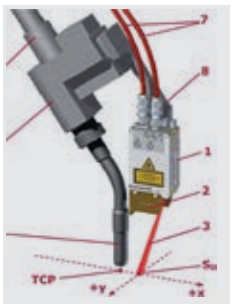
Seamtracking with laserwelding unit

Optical Seam Tracking System



Real-time seam tracking with tracking cameras from various sensor manufacturers. Communication with the robot is carried out using analog voltages with the general sensor function or via Ethernet with the MotoEyeLT software. The laser triangulation camera moves ahead of the torch and transfers position data and geometry data of the weld seam in real time. These data can be used to perform “online” corrections of the robot path and/or adaptations of the process parameters (e.g. velocity, weave parameters and weld parameters).

Camera manufacturers:



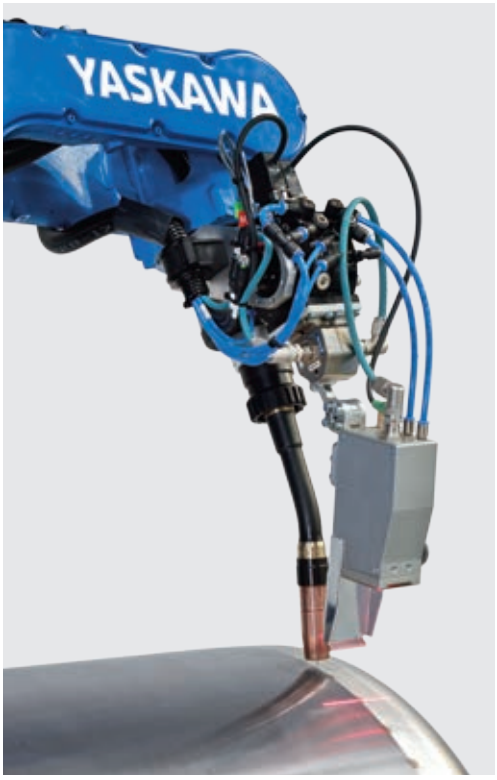
Scansonic

Meta Vision Systems

Servo Robot

YASKAWA MotoSense

MOTOSense



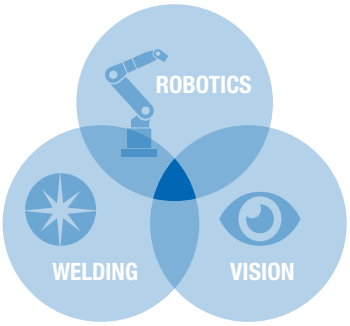
Machine vision system for adaptive robotic welding

MOTOSense vision system gives YASKAWA robots a functionality to detect, follow and weld along the actual trajectory in real time. The system may be used in TIG, GMAW (MIG/MAG) processes. Moreover, it supports vision tasks for a wide range of materials such as stainless steel, aluminium, etc.

KEY BENEFITS

- Reduced cost of jigs due to an absolute part positioning and repeatability is not required
- Unique solution for zero gap butt seam sensing
- Flexible solution for specific welding tasks
- Integrated solution for YASKAWA robot controllers

synergy in adaptive robot Welding



All prepared Macro jobs, vision parameterisation and supporting options make MOTOSense system the right tool for adaptive robot welding application. It makes perfect welding results for the most difficult welding tasks.

The complete solution offers an extremely flexible platform, which consists of MOTOSense imaging module, Imaging Process Controller and interface connection to YASKAWA DX controller.

MOTOSense packages	MOTOSense Lite	MOTOSense Ultimate
seam finding	•	•
seam tracking	•	•
Zero gap seam finding & tracking		•
adaptive welding parameter control		•
3D scan detection		•

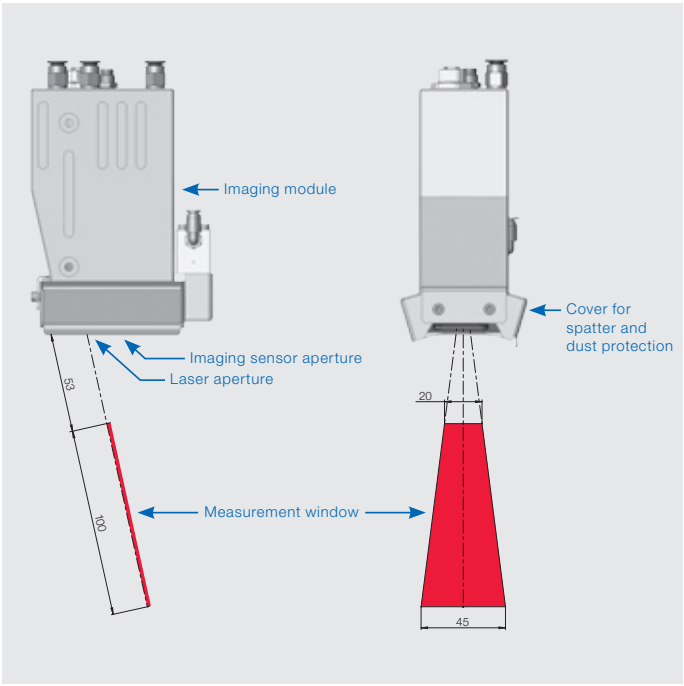
MOTOSense optional features

Camera module:
- Automatic docking station for imaging module
- Servo adjustable camera module for changeable curves
-

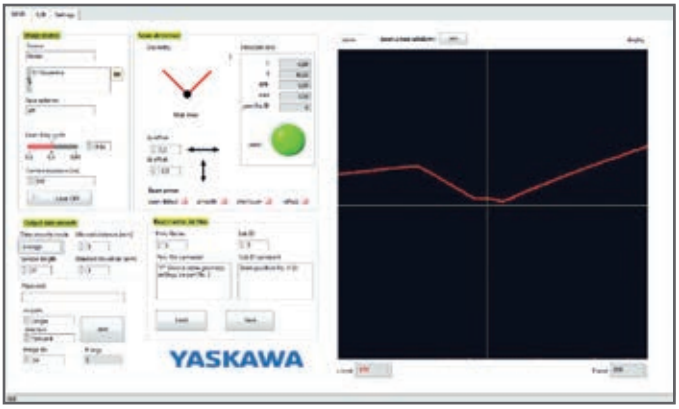
Vision features:
- Custom seam geometry algorithms
- Logging of image sequences during active sensor cycle (ON-OFF) for offl ine analysis/optimisation
- Applicable welding technologies: GMAW (MIG/MAG), TIG

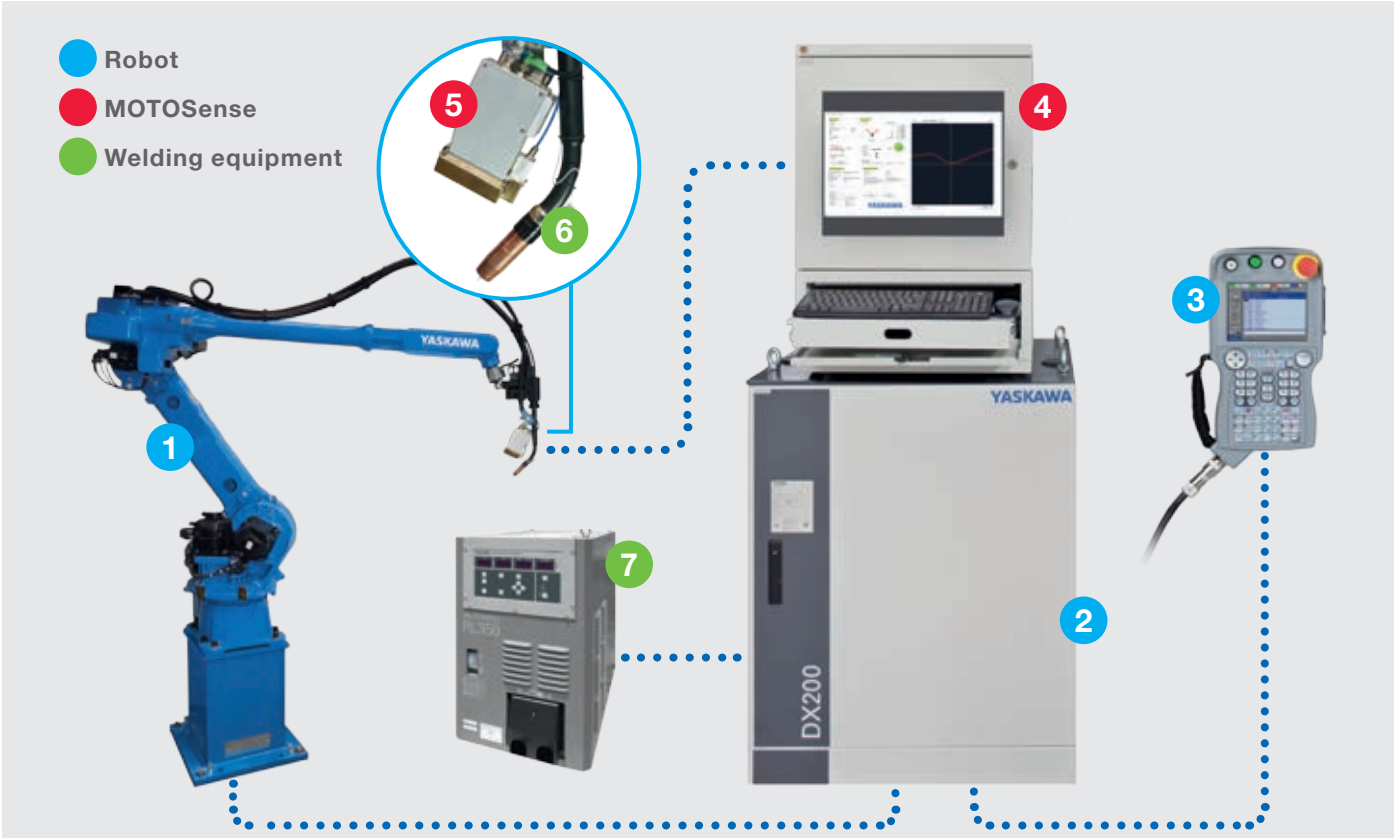
Others:
- Additional communication protocols (Profi bus, Profi net, IO communication)
- Remote support/optimisation possible (via Ethernet)

technical data	
start/end of distance measurement	50/150 mm
Field of view	35/75 mm
Measurement window	20/45 mm
Accuracy	0.1 mm
Dimensions	75 x 130 x 44 mm
Weight	0.7 kg



MOTOSense Software





Components of adaptive robotic welding cell:

1. Robot
2. Robot controller
3. Robot programming pendant (PP)
4. MOTOsense display and user interface
5. MOTOsense imaging module
6. Welding torch
7. Welding source

Welding

Arc Welding, Spot Welding, Laser Welding.
Quality. Accuracy. Precision.

YASKAWA offers special welding robots, high-quality positioners and gantry systems, and modern, customized solutions.

- Unique Multi-Robot technology for fully-synchronized coordination of up to 8 robots (or 72 axes) with a single controller
- Reduced cycle time and programming time increase the effi ciency of the system
- Very fl exible system, e.g. due to the option of jigless welding
- Integrated routing of the dress package through the upper arm and wrist joint improves accessibility in the fixtures and increases the service life of the dress packages
- Particular suitability of industrial robots for handling the heavy welding gun with power control during spot welding
- Positioning with extreme precision and speed reduces cycle times and increases productivity

Arc Welding

MA1440

MA2010

MH24

With a worldwide market share of over 30 % of all installed welding robots (source: IFR figures for 2015), YASKAWA maintains its claim to being the No. 1 in the field of automated arc welding.

With continual improvements and on-going development of all our products, we aim to continue living up to this role in the future.

Even if MIG/MAG welding and its process variants are vital to YASKAWA's day-to-day operations, processes such as TIG welding and plasma welding also play an important role at YASKAWA as the corresponding references testify.

Robots:

- **MA1440**
  (max. payload 6 kg, reach 1440 mm)
- **MA2010**
  (max. payload 10 kg, reach 2010 mm)
- **MH24**
  (max. payload 24 kg, reach 1730 mm)

Welding equipment and torches

YASKAWA works closely with virtually all renowned suppliers of welding technology for the automation sector. Hardware technology and software are perfectly coordinated with our robots and correspond to the state of the art.

As well as our own MOTOWELD-RL350 welding power source, that is ideally adapted to our robots, YASKAWA also offers the latest digital interfaces and functions in order to be able to respond as flexibly as possible to customers' requests and accommodate favored hardware manufacturers. Examples:

YASKAWA-MOTOWELD-RL350

Suppliers:

- **Lorch**
- **Dinse**
- **Fronius**
- **Merkle**
- **Abicor Binzel**
- **Miller**
- **Kemppi**
- **SKS Welding Systems**
- **EWM**
- **Lincoln Electric**
- **ESAB**
- **TB**
- **Castolin**
- **Migatronic**
- **Jäckle**

MOTOWELD-RL350

Digital Inverter Power Source for professional Welding Tasks with MOTOMAN Industrial Robots

KEY BENEFITS

- User-friendly operation with integrated user interfaces on robot teach pendant
- Communication via Ethernet
- Maximum reliability combined with very simple maintenance
- Synergy characteristics for MAGc/MAGm/MIG/pulse operation
- Pulse parameters can be set individually
- Constant current mode possible
- Optimised metal transfer with droplet detachment correction

Controlled by DX200

Maximum Reliability combined with very simple Maintenance

Modularised inverter circuits

The individual components can be maintained and inspected at the installation site and exchanged there if necessary. It is generally not necessary to exchange the device to inspect it. This reduces downtimes and costs.

Simple display with clearly visible display elements

Internal maintenance

Outer panels can be removed easily and the system has a minimum of fastening screws, significantly reducing the work time required for inspection and maintenance.

MOTOWELD-RL350

A new Era for Arc Welding

Considerably reduced weld spatter!

Maximum reliability combined with very simple maintenance

The optimised layout of the electronic components and the advantages of entirely digital data transfer make this power source a highly reliable and maintenance-friendly device that is able to meet the requirements of an industrial environment.

Constant current mode

In this operating mode that is available for selection (Heat and Waveform Control, or HAWC), internal control keeps the actual value of the weld current strength in the arc constant. In this way, weld faults resulting from varying distances between the torch and the workpiece can be minimised (e.g. inaccuracies during programming and/or work piece tolerances).

Variable pulse control (V-Pulse)

Pulse parameters can be set individually, thereby allowing adaptation of the droplet transfer in the pulse arc to the specific welding tasks. Low-spatter processes can also be implemented in the lower power range with low voltages.

Droplet detachment correction (d-Vector)

Optimised characteristics for processes under pure CO^2 enable controlled droplet transfer: improved arc stability goes hand in hand with reduced weld spatter and a smoother seam surface.

Variable Pulse Control

What is meant by variable pulse control?

In the past, the arc voltage had to be reduced when working with pulse processes in the lower power range in order to avoid burn-through and undercutting. This led to irregular seam appearance and increased spatter. With variable pulse control, the pulse shape responsible for droplet transfer can be adapted to the specific welding task by means of additional parameters. This enables a more stable arc with reduced weld spatter.

Test details

This behavior is illustrated, for example, in subassemblies for car axles.
Shielding gas: M21 – weld conditions: 170 A, 23 V – robot velocity: 80 cm/min

Welding results

Conventional method

With the conventional method, there were frequently irregularities in the formation of the weld bead after welding (see figure top left).
Furthermore, there was increased spatter during welding (see figure on right).

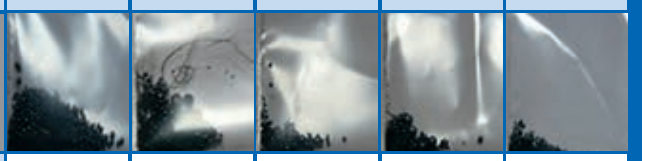
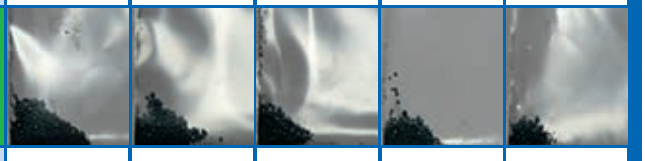
Enlarged view

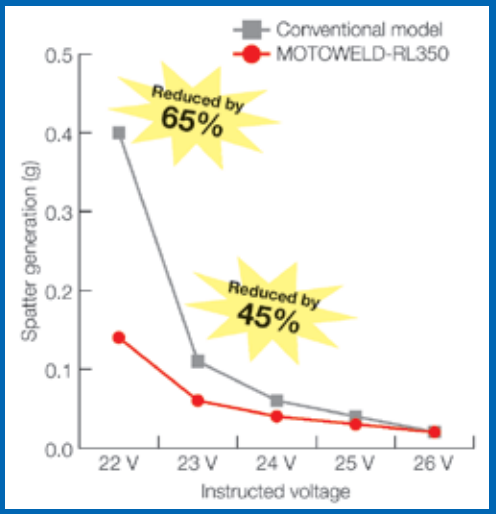
New process (with variable pulse control)

With the new method (with variable pulse control), the bead is perfectly smooth after welding (see figure).
Moreover, compared with conventional processes, significantly less spatter is generated.

Enlarged view

Comparison of spatter generation

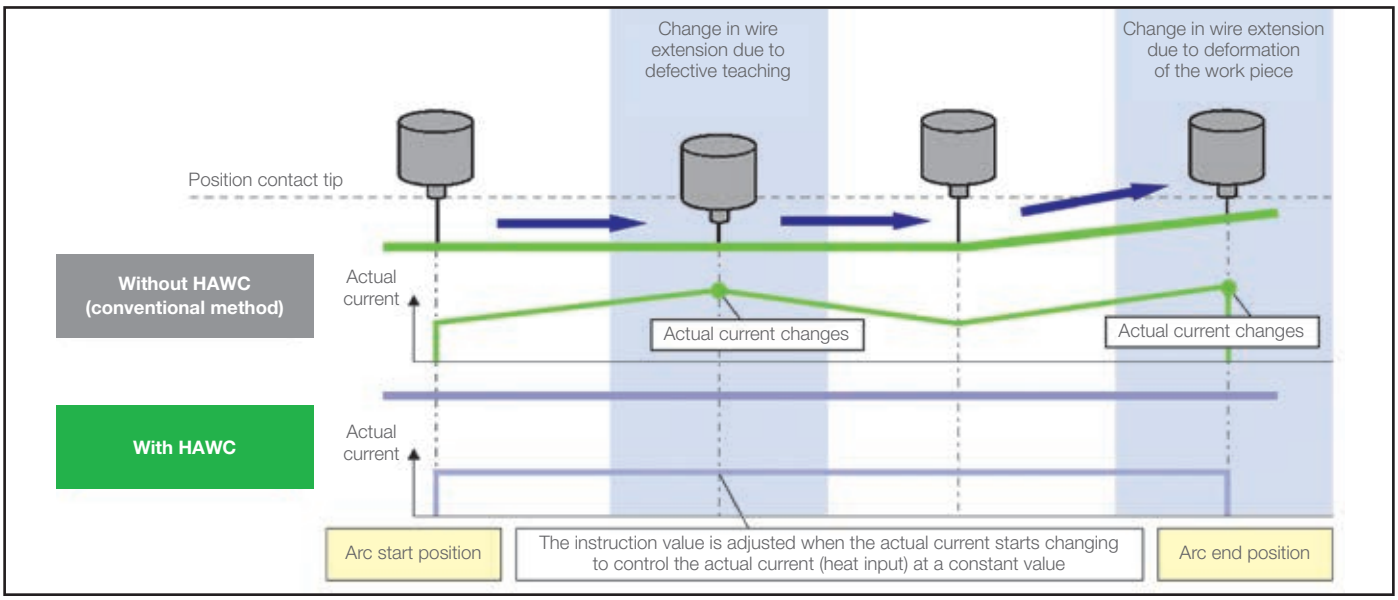
Robot velocity	80 cm/min				
Current	175 A				
Voltage	22 V	23 V	24 V	25 V	26 V
Conventional model					
Spatter generation	0.40 g	0.11 g	0.06 g	0.04 g	0.02 g
MOTOWELD-RL350 (Droplet detachment correction)					
Spatter generation	0.14 g	0.06 g	0.04 g	0.03 g	0.02 g



Constant Current Mode

What is meant by HAWC (Heat and Waveform Control)?

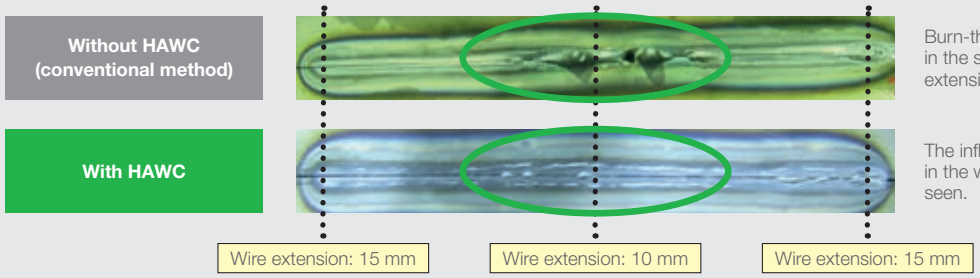
The length of free wire (distance between contact tip and work piece) may vary according to the accuracy of the work piece and programming. With conventional characteristics, the weld current changes in accordance with these changes in distance. This can result in burn-through or insufficient penetration. If the HAWC function is used, the command and actual values for current and voltage are compared in real time. The internal control of the power source keeps the arc current constant at the specified value. This enables controlled heat input, and weld faults resulting from the aforementioned tolerances can be avoided.



Test details

General conditions for test welds with and without the HAWC function. Length of free wire varies between 10 mm and 15 mm during welding. **Work piece thickness: 4.5 mm – seam type: butt joint – weld conditions: 270 A, 26 V – robot velocity: 80 cm/min**

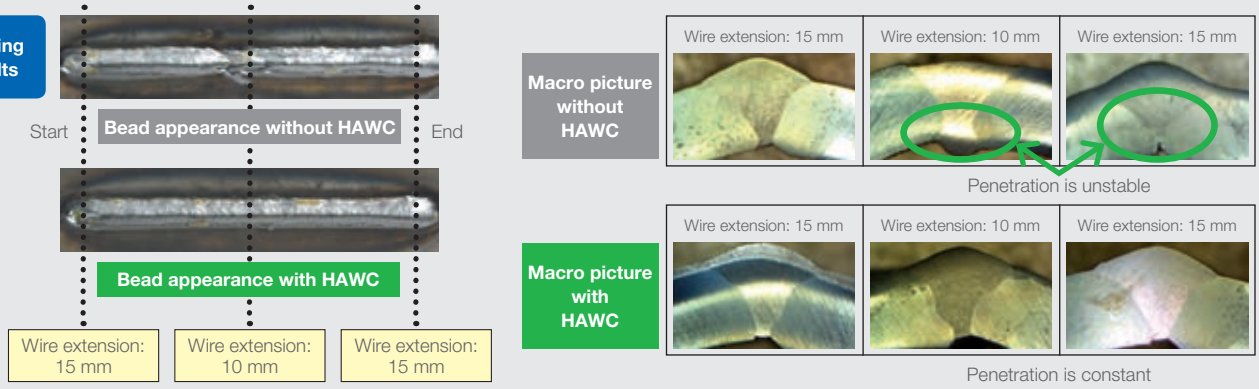
Welding results



Test details

Welding at butt joint on tube with wall thickness of 5 mm and length of free wire continuously changing between 10 mm and 15 mm.
Shielding gas: M21 – weld conditions: 200 A, 19.7 V – robot velocity: 60 cm/min

Welding results



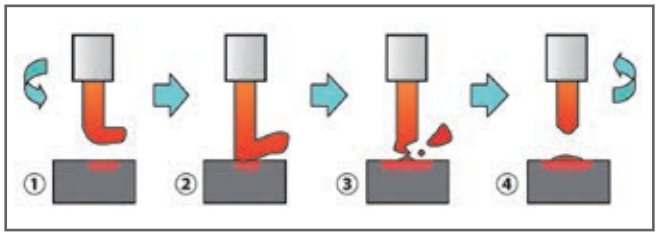
Droplet Detachment Correction

Conventional CO_2 welding processes

Compared with MAG welding under mixed gases, the arc under pure CO_2 is more unstable, resulting in greater production of spatter and a rippled, irregular seam surface.

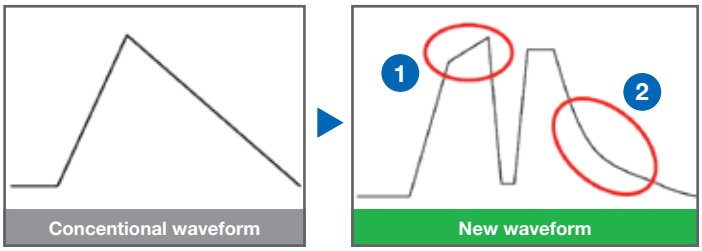
This is illustrated in the figure opposite:

1. Electromagnetic forces in the arc cause deflection of the droplet.
2. Undefined metal transfer occurs in the short circuit.
3. The surplus metal is ejected as weld spatter.
4. The arc is re-established.



What is meant by droplet detachment correction?

The short-circuit response has been redefined by optimising the curve for the rising and falling edges of the current: the gradient of the edges can be adapted to the specific welding task, enabling stable MAGc processes with reduced spatter generation and finely rippled seam appearance.



1 Improved arc stability with gradual increase in current.

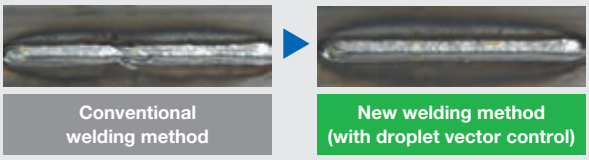
➠ **Stable process with low generation of spatter.**

2 A non-linear drop in current after break-up of the short circuit prevents the arc from being extinguished completely in the next short circuit.

➠ **Undefined, coarse droplet formation is suppressed. The contact surface for electromagnetic forces is reduced, as is the ejection of spatter.**

Test details

Current: 150 A – Voltage: 16.3 V – Robot speed: 80 cm/min – Shielding gas: 100% CO_2 used



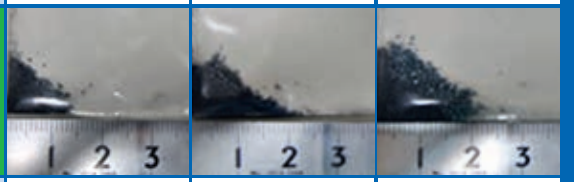
Conventional welding method

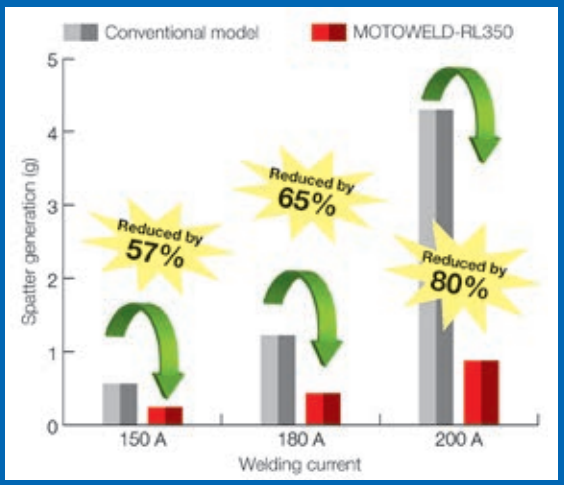
New welding method (with droplet vector control)

Welding results

The instability of the arc in conventional CO_2 welding results, in many cases, in irregular, coarsely rippled weld beads. The optimised characteristic curve with droplet detachment correction enables a stable process with uniform weld beads and a finely rippled surface.

Vergleich der Spritzererzeugung

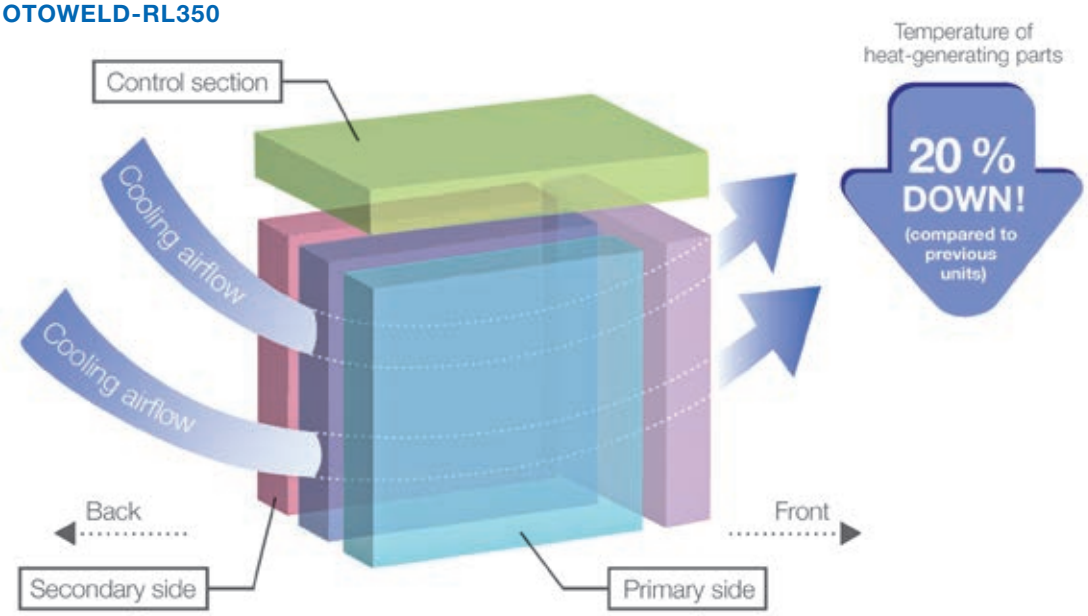
Current	150 A	180 A	200 A
Conventional model			
Spatter generation	0.565 g	1,.24 g	4.301 g
MOTOWELD-RL350 (Droplet detachment correction)			
Spatter generation	0.242 g	0.431 g	0.873 g



Reinforcement of the Cooling/Dustproofing Systems

The interior of the unit has been divided up into sections to prevent dust getting into the control and power circuits, improving reliability in adverse environments with conditions like high temperatures or dust. This is combined with a new construction that features channels providing a cooling airflow in the centre of the unit and concentrates the heat-generating parts on the cooled faces, so cooling efficiency is maximised while ensuring dustproofing. The number of exhaust routes has been increased too, giving 20% better suppression of temperature rise than previous units.

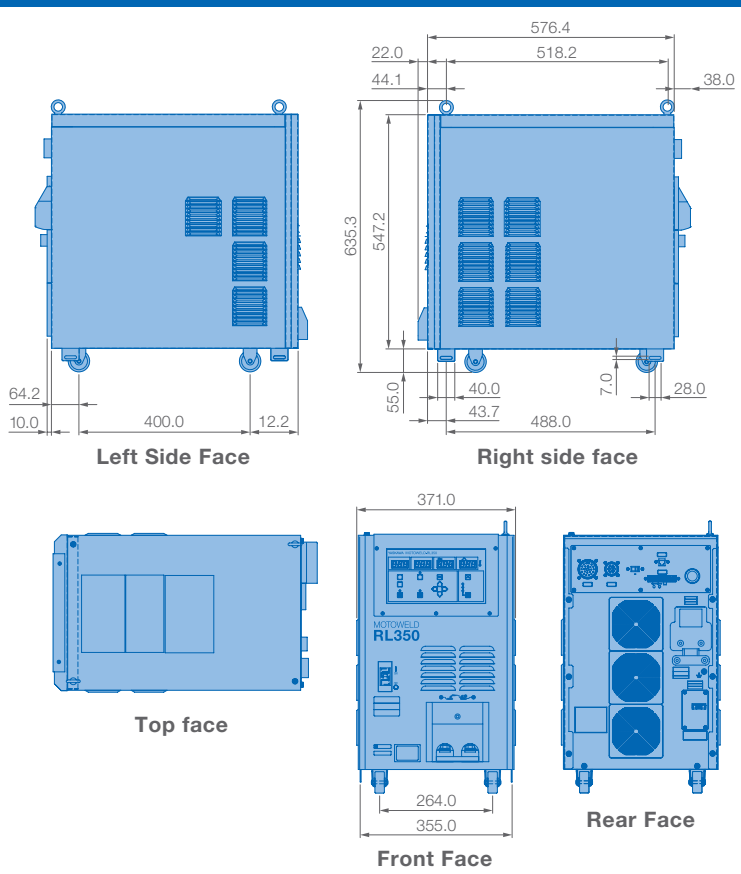
Aufbau der MOTOWELD-RL350



Ratings and Specifications

Welding power source model	YWE-RL350-CEO
Rated input voltage, number of phases	200 – 220 VAC ±10 % / 380 – 400 VAC ±10 %, three phases (Changing the input voltage requires changes to the internal wiring.) Setting on shipment: 380 – 400 VAC
Rated frequency	50/60 Hz
Rated input	18 kVA, 15 kW
Rated output current	30 – 350 A (depending on wire diameter)
Rated output voltage	12 – 36 V (depending on wire diameter)
Rated operation rate	60 % (for 10 minutes)
Welding method	CO^2/MAG/MIG/Puls
Welding material	Iron, stainless steel
Dimensions	371 (B) × 636 (D) × 602 (H) mm (not including projecting parts such as eyebolts or screws)
Approx. mass	60 kg

Dimensions



MOTOPAC-WL200+ (Servo Torch)

MOTOMAN Robot | Power Source MOTOWELD RL350 | Robot-Controller DX200

High Quality Welding with servo-controlled Wire Feeder Technology

KEY BENEFITS

- Ultra low spatter generation
- Greatly improved joint-welding of thin sheet metals
- Penetration secured by original servo technology
- System without additional interference
- High productivity by controlled motor close to the process
- Improved CO_2 characteristics enable cost savings by using cheaper shield gas
- Plug & Play solution-package: Robot, controller, teach pendant, power source and servo-torch system
- Programming via teach pendant

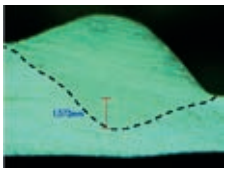
MOTOMAN MS165 | MOTOMAN MA1440

Controlled by DX200

Comparison Penetration

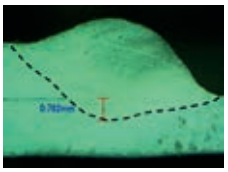
Welding condition:
Welding speed: 80 cm/min
Current: 250 A
Thickness: 2. 00 mm

Conventional mag welding



Depht: 1.073 mm

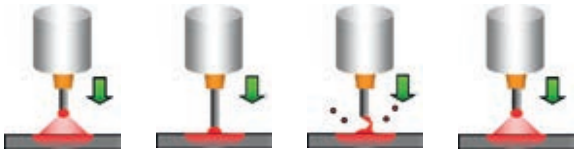
Servo-controlled mag welding



Depth: 0.782 mm

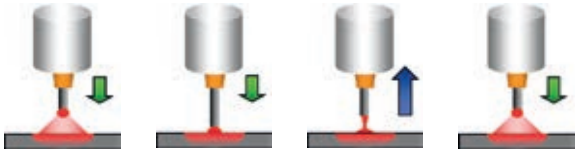
Comparison Spatter Generation

Conventional short arc welding



Schweißspritzer
entstehen

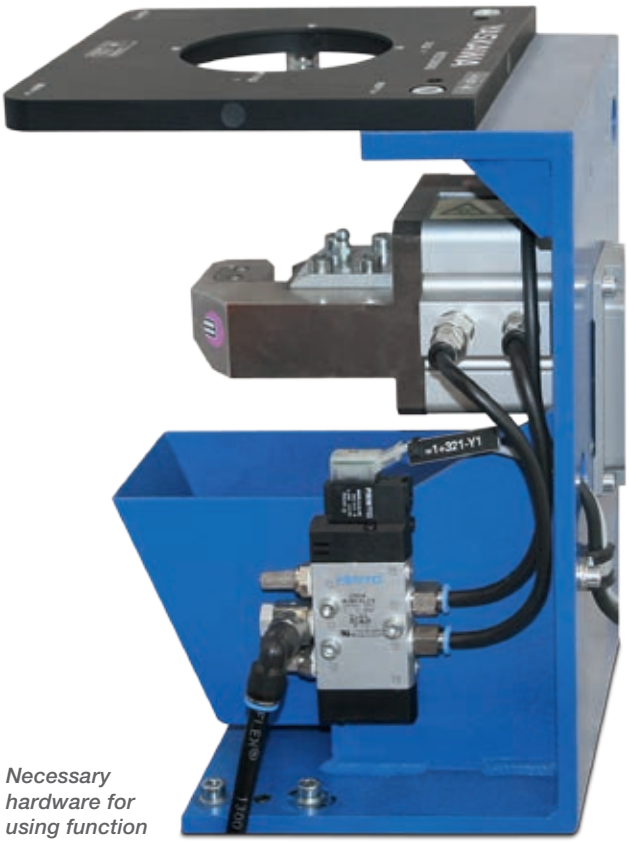
Short arc welding with servo technology



Reduced spatter
by reverse rotation

Technical data MOTOPAC-WL200+	
Type of the power source	Power range 350 A / 36 V (60 % DC), air cooled
Type of the wire feeder	Servo controlled
Welding methods	Conventional CO_2/MIG/MAG/Pulse and heat reduced process: Arc control by servo controlled wire feeding
Wire diameter (short and pulse arc welding)	1.2 mm (1.0 mm in preparation)
Wire diameter (servo method)	
Welding material (short and pulse arc welding)	Mild and stainless steel
Welding material (servo method)	
Interface to robot -controller	Ethernet communication 100 % control by robot PP (weldcom function)

Q-Set



Necessary hardware for using function

Visual Torch Inspection and TCP Adjustment System

The YASKAWA Q-Set is a visual torch inspection and TCP adjustment system for MOTOMAN welding robots. An inspection program is executed at regular intervals to check the wire position on the torch. In this way the contact tip can be checked for accurate positioning and wear and the wire quality (twist).

The robot enters the testing device with a torch in such a way that it interrupts two laser light beams with the wire, while keeping the torch intact.

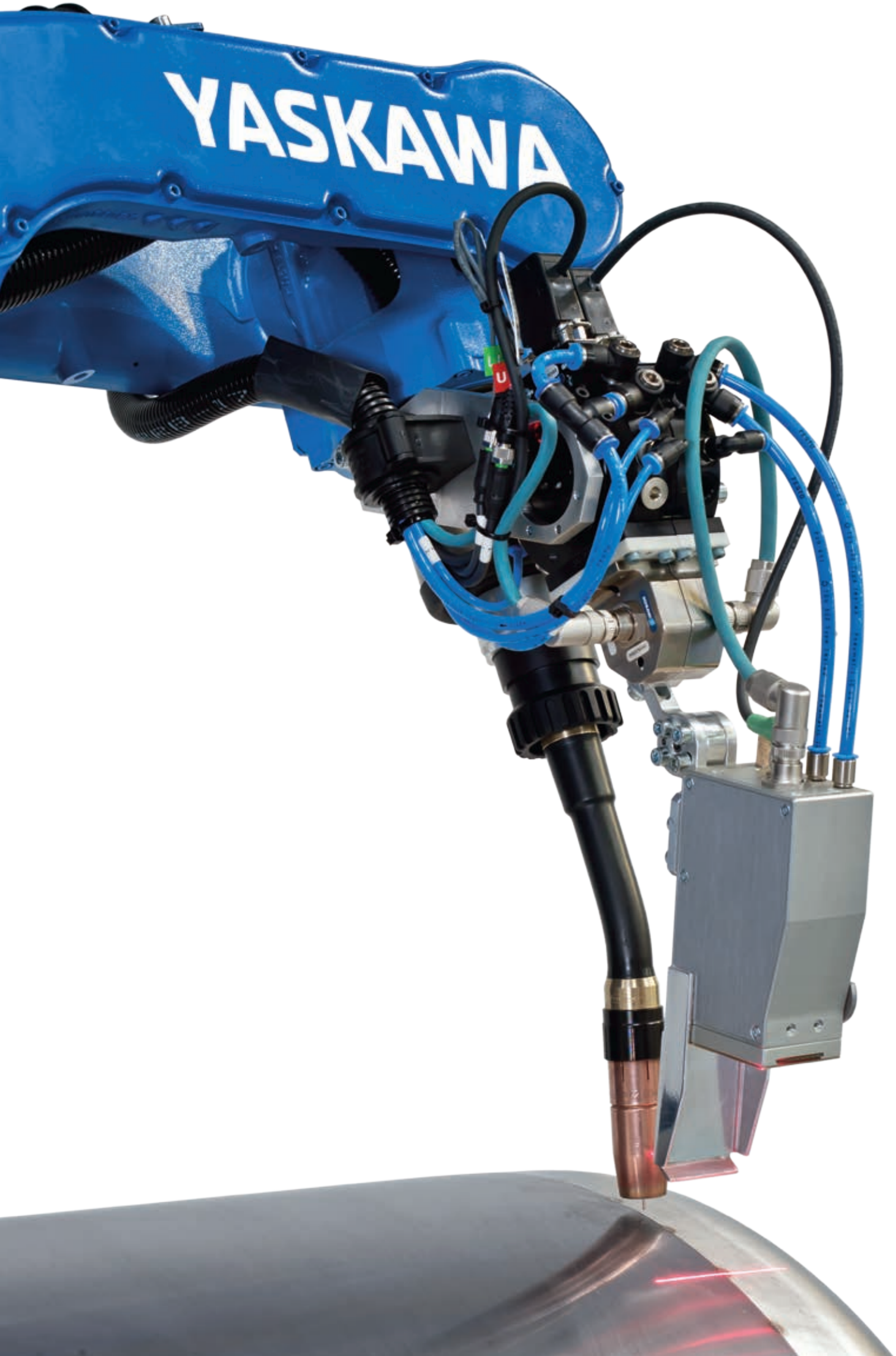
If the tool is deformed, then at least one of the laser light barrier isn't interrupted. In that case either an alarm can be displayed and the cause of the error can be fixed by the operator, or the automatic measurement of the torch can be started.

In case of the automatic measurement and correction of the programs, the torch (wire) is measured with the light beams in X, Y and also in Z direction by means of a special robot program.

The new tool data is now used to convert and to correct all programs as a Relative Jobs. If the maximum permissible torch deviations are exceeded, an error message is displayed.

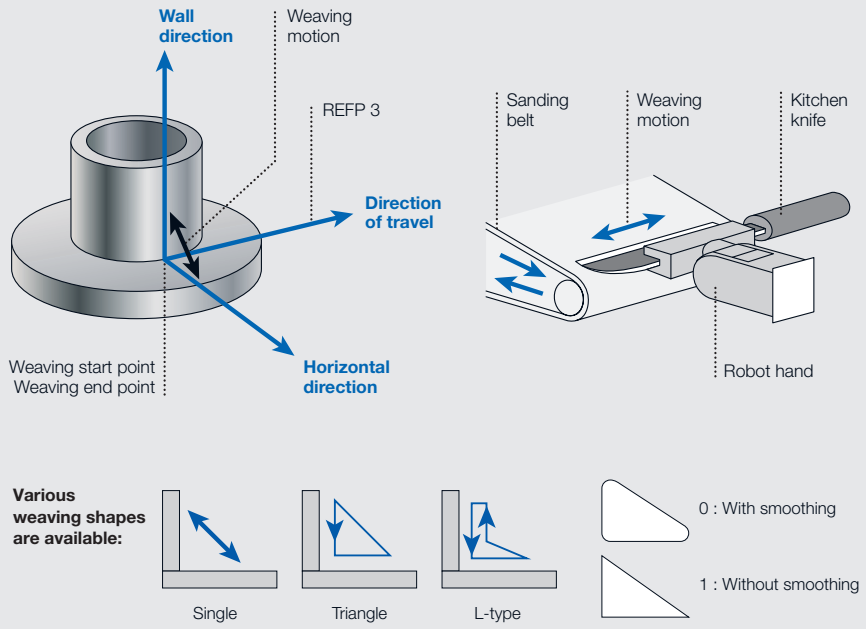
KEY BENEFITS

- Quality assurance
- Higher availability through early detection of wear on the torch
- Torch check in regular intervals
- Automatic program correction after collision
- Automatic TCP adjustment after torch change
- Automatic tool-angel correction (optional)
- Automatic correction of the Tool-data
- Error message if the maximum deviation of the TCP is exceeded


YASKAWA

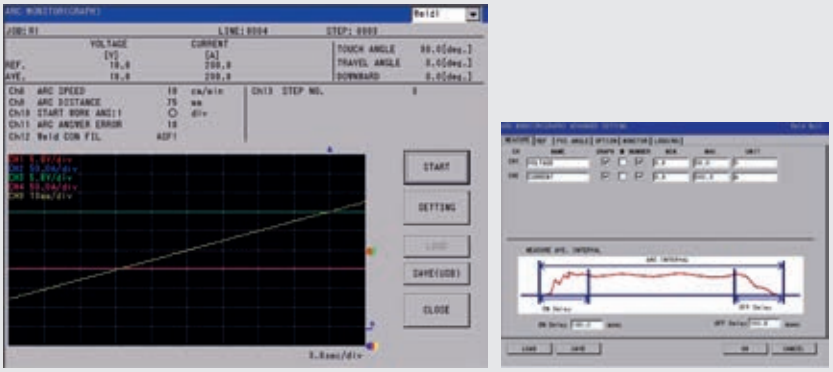
Software Functions Arc Welding

Hover Weaving



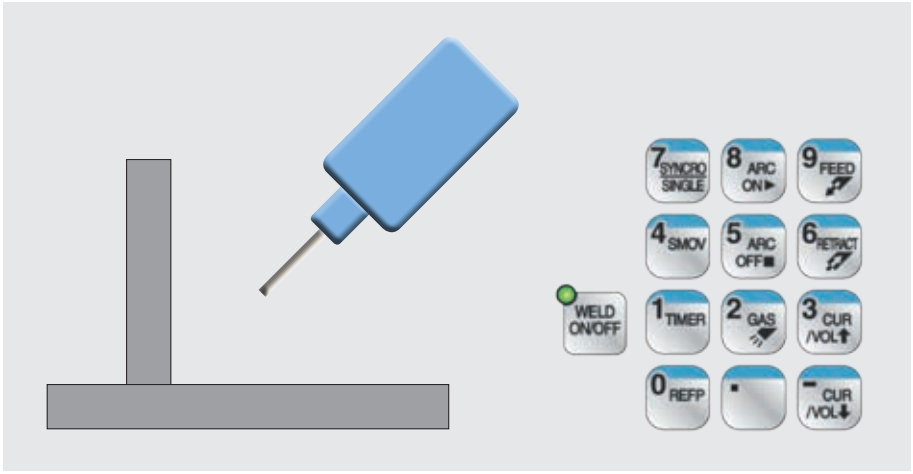
The “hover weaving function” is special weaving mode for applications in which robot positions for start-/end-points are the same: During process robot does not move on a trace!.
So there’s no travel direction for the robot and therefore weaving direction cannot be determined. For these sequences “hover weaving” enables usage of weaving function.

Graphical Arc Monitoring



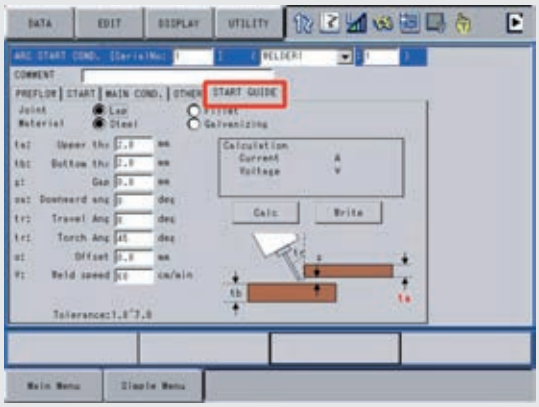
The Graphical Arc monitoring function samples the arc-welding related data and shows them on the programming pendant as a graph and numeric values. The mean value of the last welding is displayed.

Welding in Teach Mode



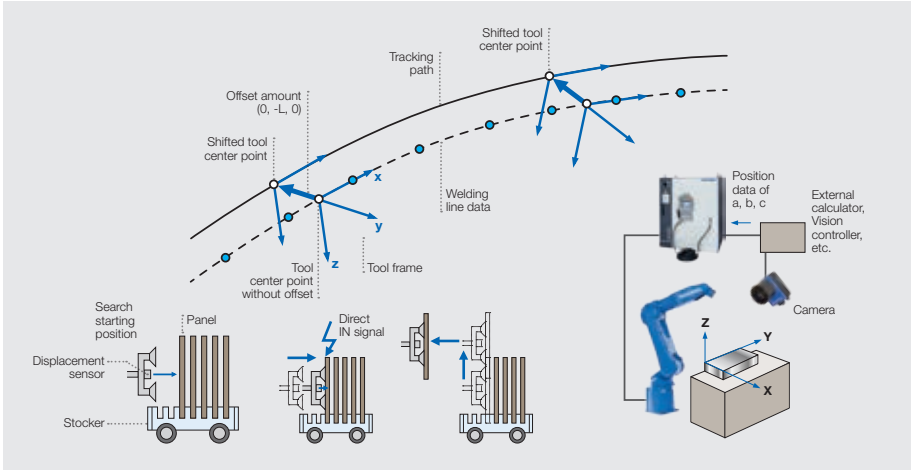
This function enables execution of ARCON/ARCOF instructions not only during automatic mode but also in teach mode.
Welding conditions can be checked directly during programming.

Welding Condition Guide



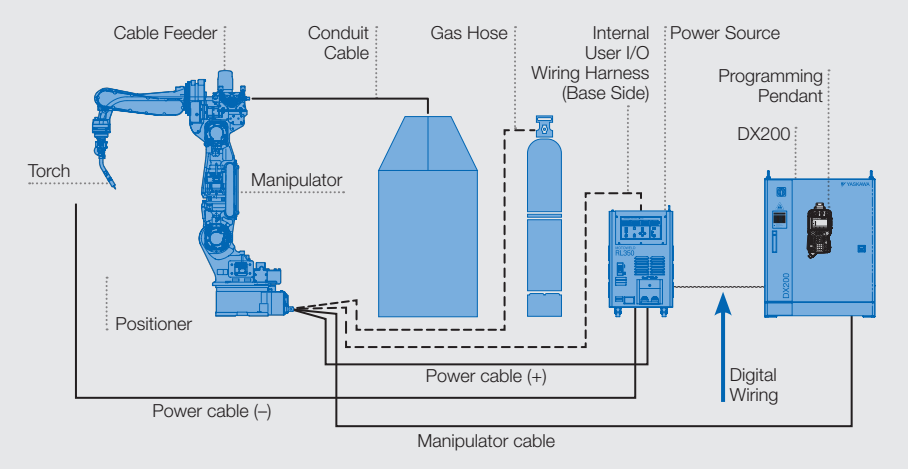
Easier preparation and optimizing of welding parameters.
Influence factors like material, sheet thickness, torch position or seam shape can be preset in a mask. Parameter recommendations can be directly taken over from data base into arc start files.

General Sensor Function



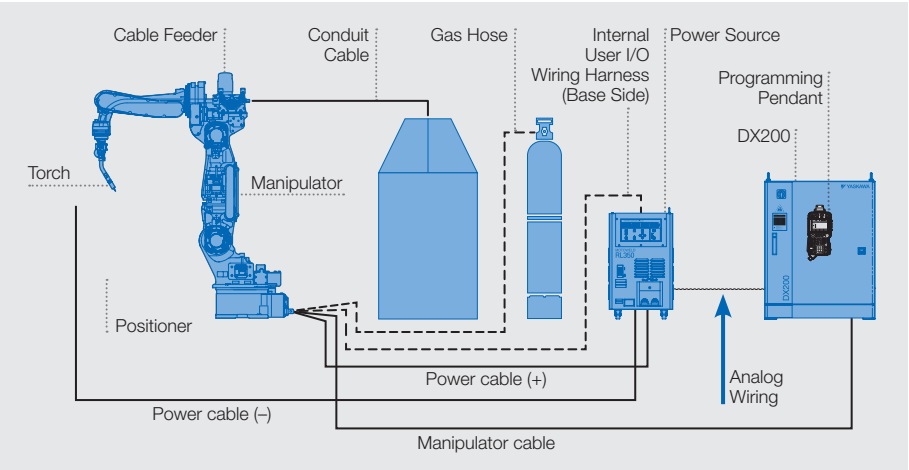
Universal interface for all kinds of analogue sensors. By means of sensor inputs different functions can be realized, for example tracking, speed control and position adjustments.

ARC-Digital Basic



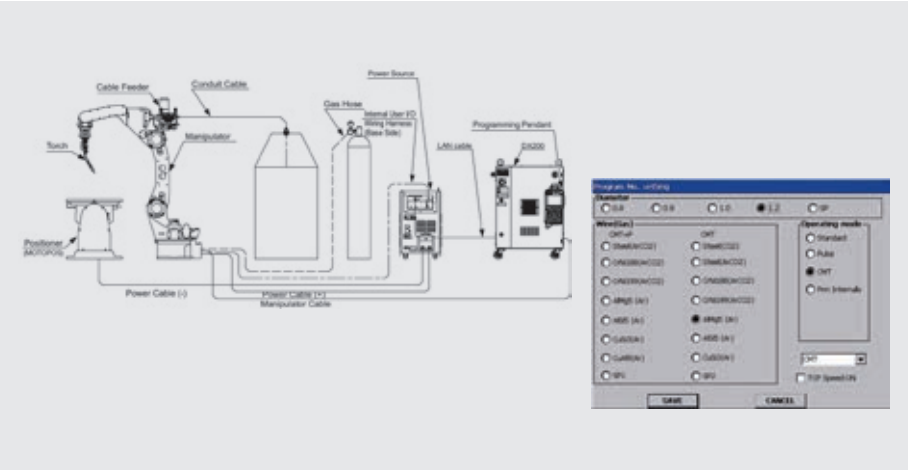
This function enables the communication between robot controller and welding power source by digital interface.

ARC-Analog Basic



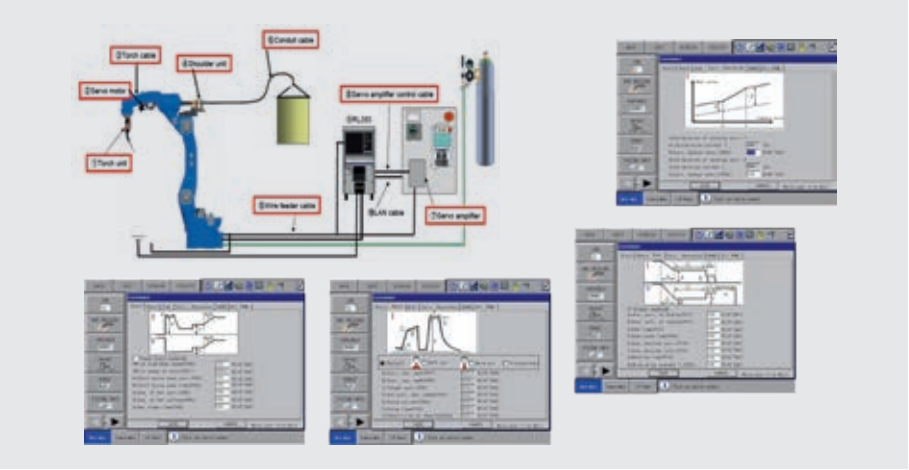
With the ARC-Anlag Basic function the robot controller and the welding power source can communicate by digital interface.

ARC-Weldcom Fronius



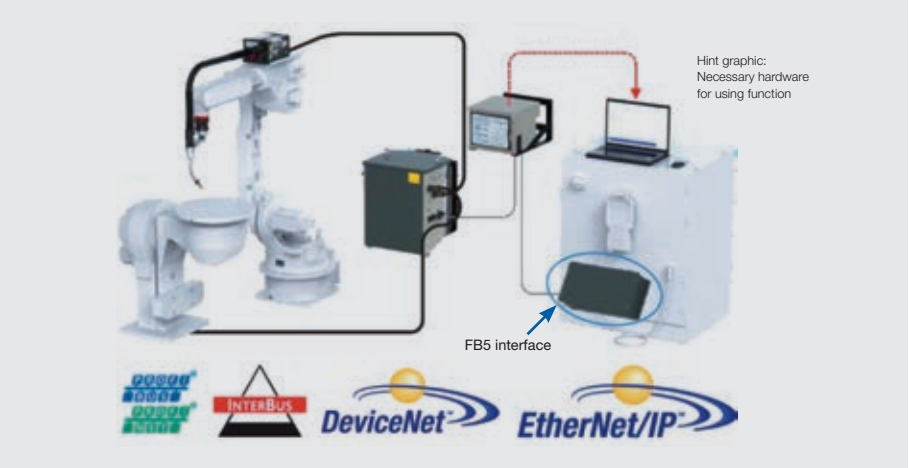
The WELDCOM function serves as a digital interface that communicates via Ethernet with an arc welding power source.
Thefunction provides high data rate transmission between DX controller and the welding power source, enables the welding power source parameter to be set from the programming pendant, and monitors graphically welding current and voltageduring welding.

ARC-Weldcom MotoWeld Plus



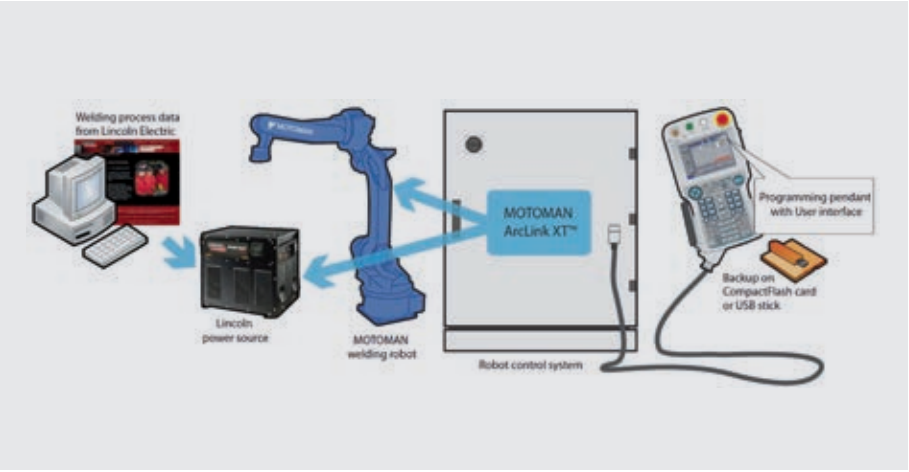
MotoWeld Plus is designed for MOTOPAC WL200+ welding equipment package (Servo Torch).
The WELDCOM function serves as a digital interface that communicates via Ethernet with an arc welding power source. The function provides high data rate transmission between DX200 and the welding power source, enables the welding power source parameter to be set from the programming pendant, and monitors graphically welding current and voltage during welding.

ARC-SKS FB5 – Basic



The “ARC SKS FB5 – Basic” function enables communication between robot controller and welding system with field bus interface FB5.

Lincoln ArcLinkXT (Digital Arc Welding Interface)



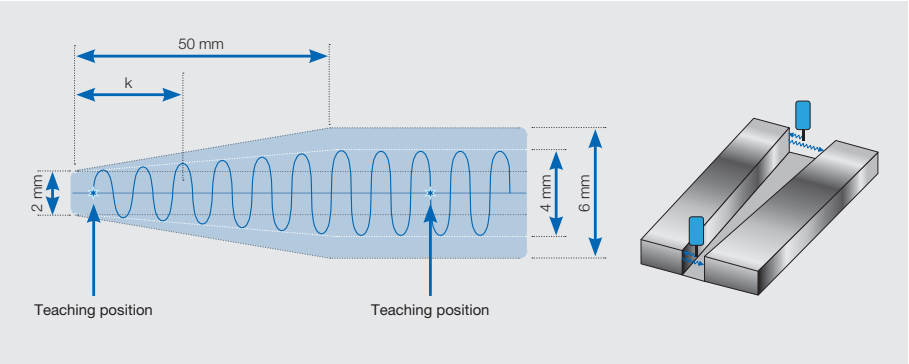
This software, based on Ethernet communication, enables an exclusive operating and controlling of current Lincoln power sources using the YASKAWA programming pendant. Up to four interfaces per controller can be managed. There is no need of additional control elements on the power sources.

Multi Layer Welding

Example for multi layer welding on electrodes for ESR process:
Variable layer design for hardfacing and seam welding

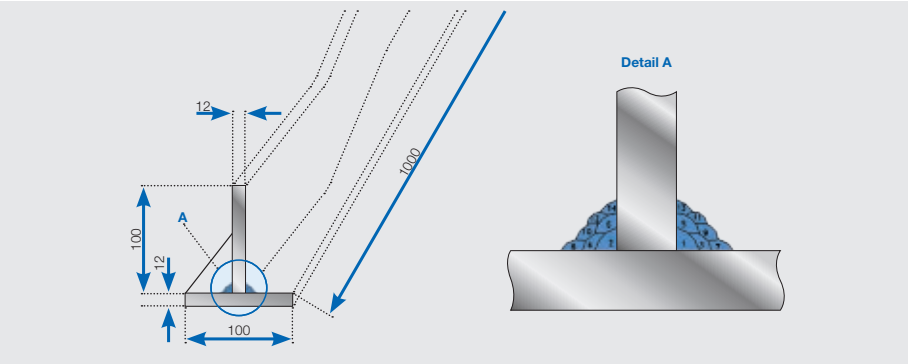
The multi layer welding package includes mainly the following four single functions:

Weaving Adjustment



This function can be used to compensate variable conditions in a welding groove by continuous adapting of weaving parameter and speed.

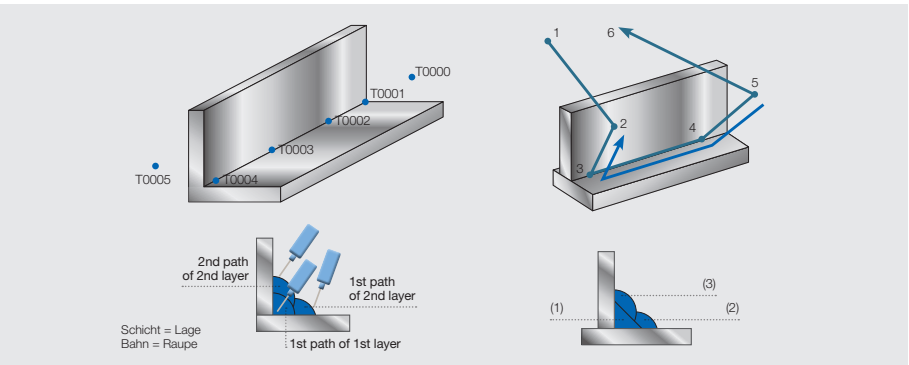
Point Variable (T-variable)



The „Point variable“ function simplifies programming of multi-layer seams.

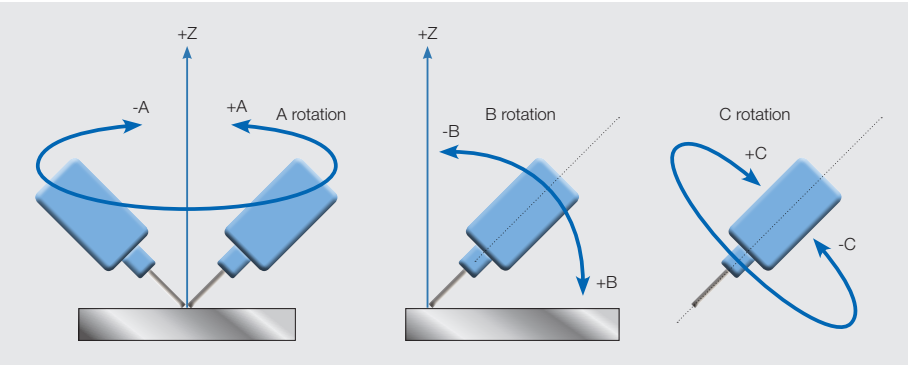
This function is a fixed part of the Multi-Layer function package. This special type of position variables has been created to simplify the programming of multi-layer welding structures.

Memo Play



Recording and reproduction of different kinds of paths during multi-layer welding. In the first layer arc sensing will compensate the offsets between taught and current positions with ComArc or MotoEyeLT.

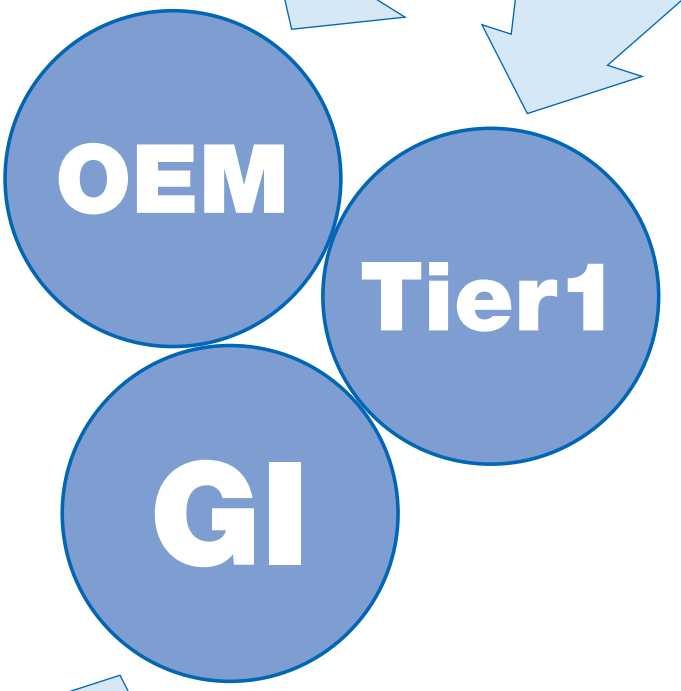
Euler Angle



A multi layer design which is created once can be repeated at any position in the cell. The programming works in a special tool coordinate system which corresponds to “Euler angles” where the “alpha angle” means forehand/ backhand welding and the “beta angle” equals torch orientation in the groove.

Industrial Sectors

- **Module beams**
- **Exhaust systems**
- **Seats**
- **Body and frame parts for all kinds of vehicles**
- **Axles**
- **Gear components**
- **Cross beams**
- **Bumpers**



- **Vessel construction and systems engineering**
- **Underfloor vehicles/fork lifters**
- **Furniture production**
- **Road building**
- **Earthmoving/excavators**
- **Trailer construction**
- **Ventilation technology**
- **Railway vehicles**
- **Agricultural machinery**

Turnkey Systems

1. Compact Cells & Standard Systems

MOTOMAN ArcWorld V2

Turnkey Robotic Arc Welding Cell

All in one Place

The robot, positioner, controller and power supply are all mounted on a common platform. This design makes it easy to move the whole robot cell and start up again if needed.

ArcWorld V2 has a single working area design for the robot and operator respecitvely. The operator has a permanent, practical and bright workplace with the required materials close at hand. It is also possible to have two robots working without increasing the floor space.

SCOPE OF DELIVERY

- Platform, metal walls, plexi doors and fume hood with outlets for ventilation and exhaust
- MOTOMAN-MA1440 industrial robot
- Positioner with two stations, 500 kg payload per station
- Start panel
- CE marking

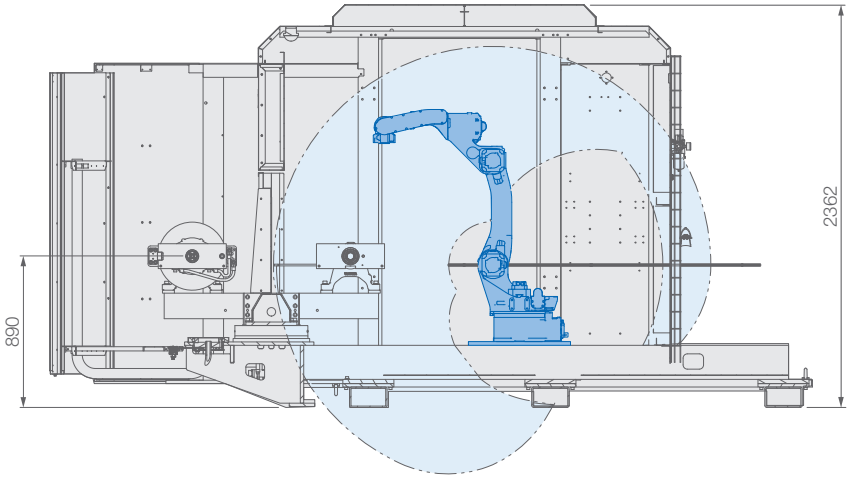
KEY BENEFITS

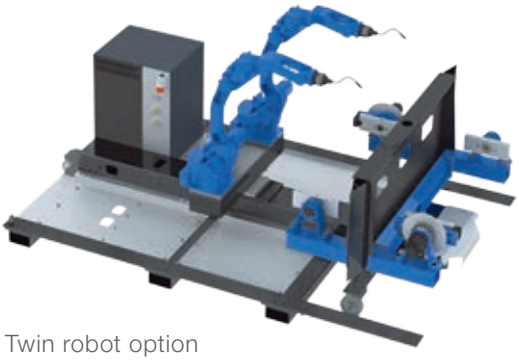
- Easy to operate
- Short delivery times
- Small footprint, but generous space for the robot
- Easy to install, and to relocate on site
- Material can be loaded with an overhead crane
- Practical and bright environment for the operator
- Prepared for offline programming

OPTIONS

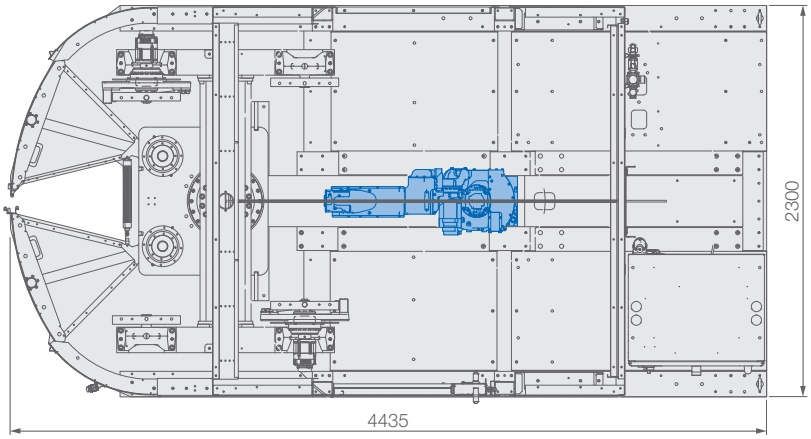
- Welding equipment for MIG/MAG welding
- Twin robots
- Media transfer (signal, air, current) for the positioner
- Fixed positioner table
- Operator's panel with HMI
- Service door located on the oposite (left) side
- MotoSim with kinematic simulation
- Beacon light

Controlled by DX200

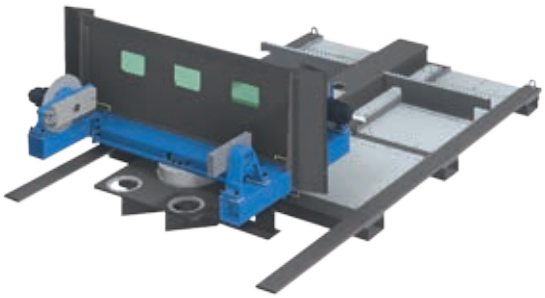




Twin robot option



Techncal data MA1440	
Controlled axes	6
Max. payload [kg]	6
Repeatability [mm]	±0.08
Max. working range R [mm]	1440



Technical data Positioner	
Max. payload [kg]	500 per station
Max. distance COG to rotation-axis [mm]	150
Rated speed [rpm]	9.0
Index time [sec.]	3


ArcWorld

MOTO-Compact RVE

Mobile Compact Welding Cell

The ideal solution for effectively and flexible robotic welding!

The cost-effective MOTO-Compact RVE welding cell is most suitable for universal application in the production of small parts.

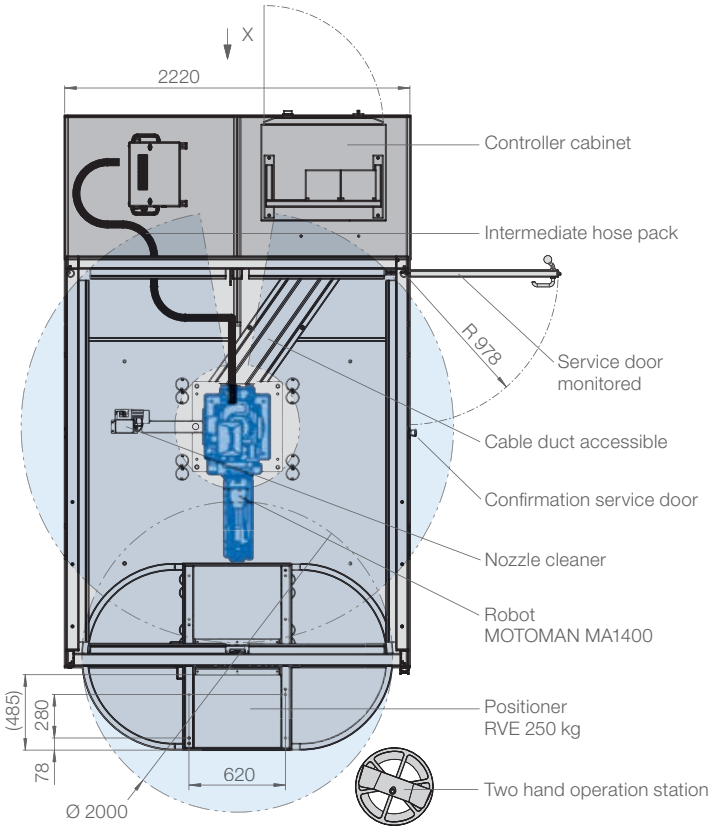
The compact cell can be repositioned quickly and easily using a forklift truck.

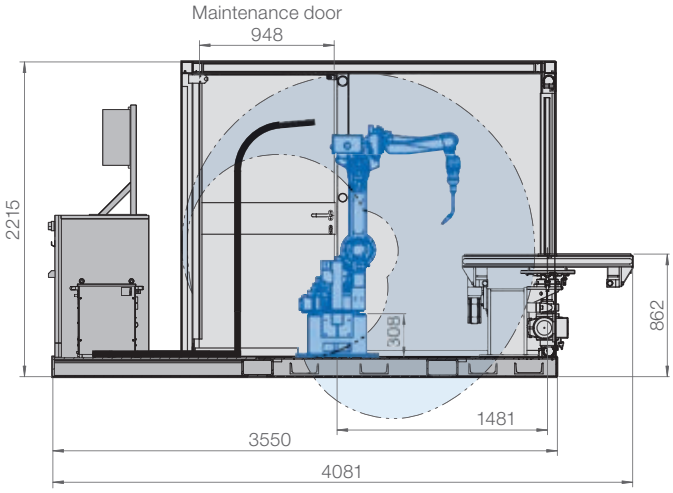
KEY BENEFITS

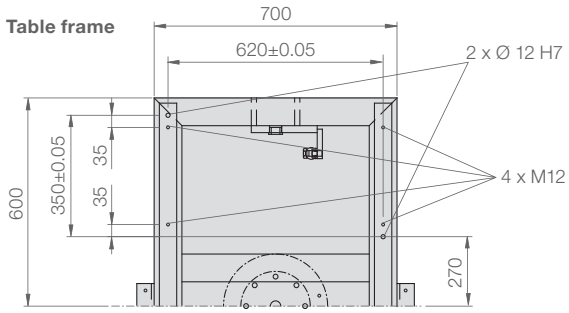
- Easy access to automated manufacturing
- Extremely compactness
- Short expenditure of time for assembling and disassembling
- No position variations by relocation
- Ideal solution for MIG/MAG welding
- Optional: TIG or plasma welding
- MOTO-Compact RVE according to CE

Controlled by DX100

Controlled by DX200





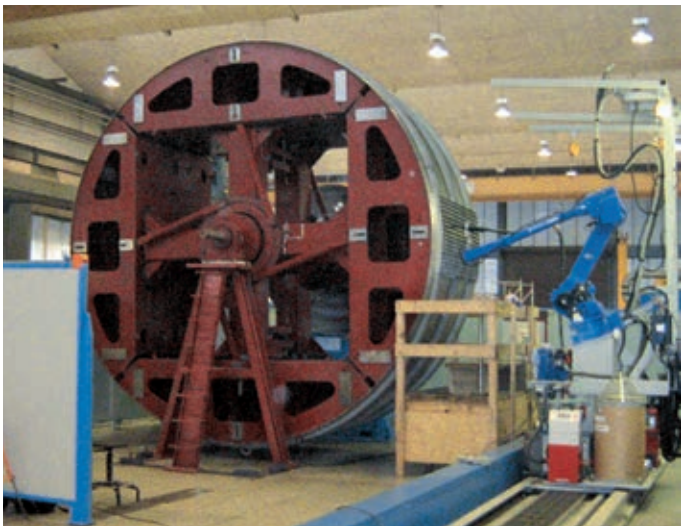


Scope of supply
1 x MOTOMAN welding robot MOTOMAN MA1400 or MH6
1 x MOTOMAN DX100 controller
1 x MOTOMAN electrical rotary with drive (type RVE)
1 x automatic torch cleaning unit
1 x self-supporting groundplate
1 x safety cabine with maintenance door
– welding equipment from 300 A – welding torch with crashbox and hose package – nozzle cleaning device

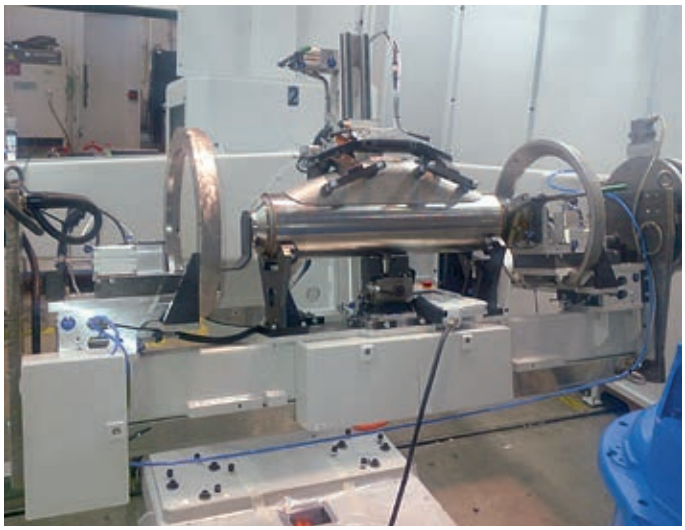
Technical data		
Robot	MOTOMAN MA1400 or MH6	
Controller	DX100 or DX200	
Cycle time	2 x 180°	
Station change	approx. 5 sec.	
Max. payload	250 kg per station for sym. load	
Drive	AC-Motor, 0.75 kW	
Media supply	optional	
Possible fixture sizes	(W) 1600 x (H) ca. 1000 x (D) 500 mm (W) 1200 x (H) ca. 1000 x (D) 700 mm	
Cabine size	Length: 4080 mm Width: 2220 mm	Height: 2215 mm Weight: approx. 2800 kg

2. Special Systems

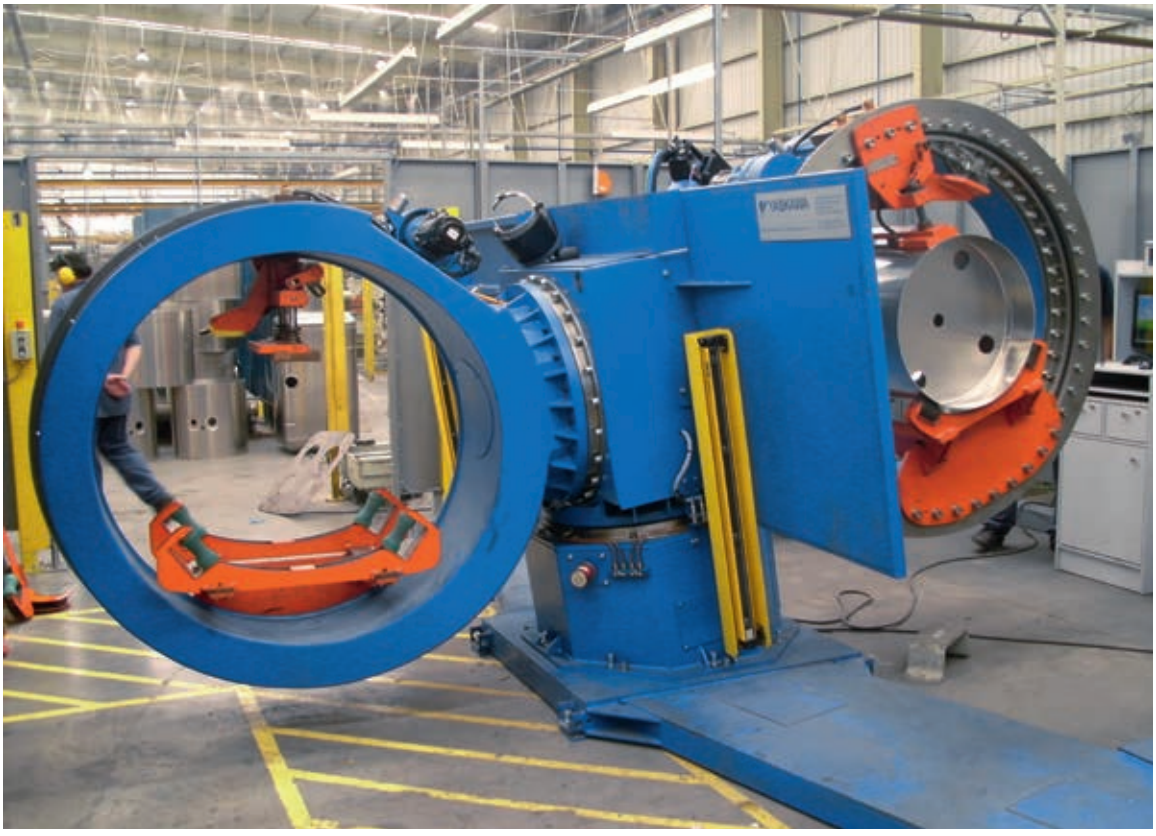
Application Examples



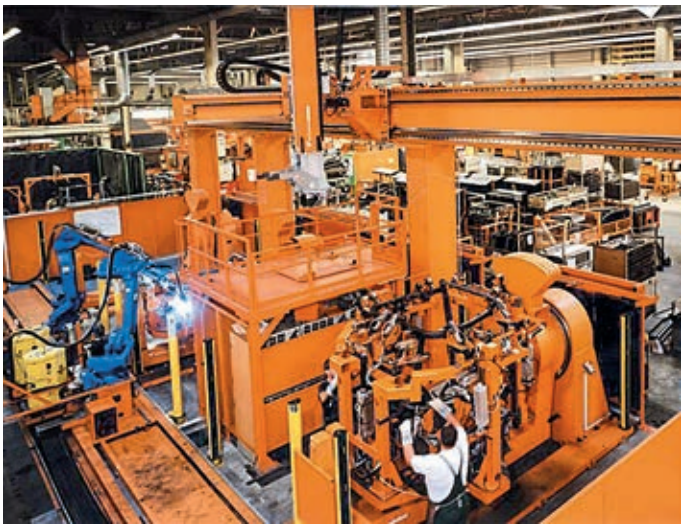
System for the welding of machine components for the paper industry



Jig construction in MSG welding cell for flowmeters (pressure vessels)

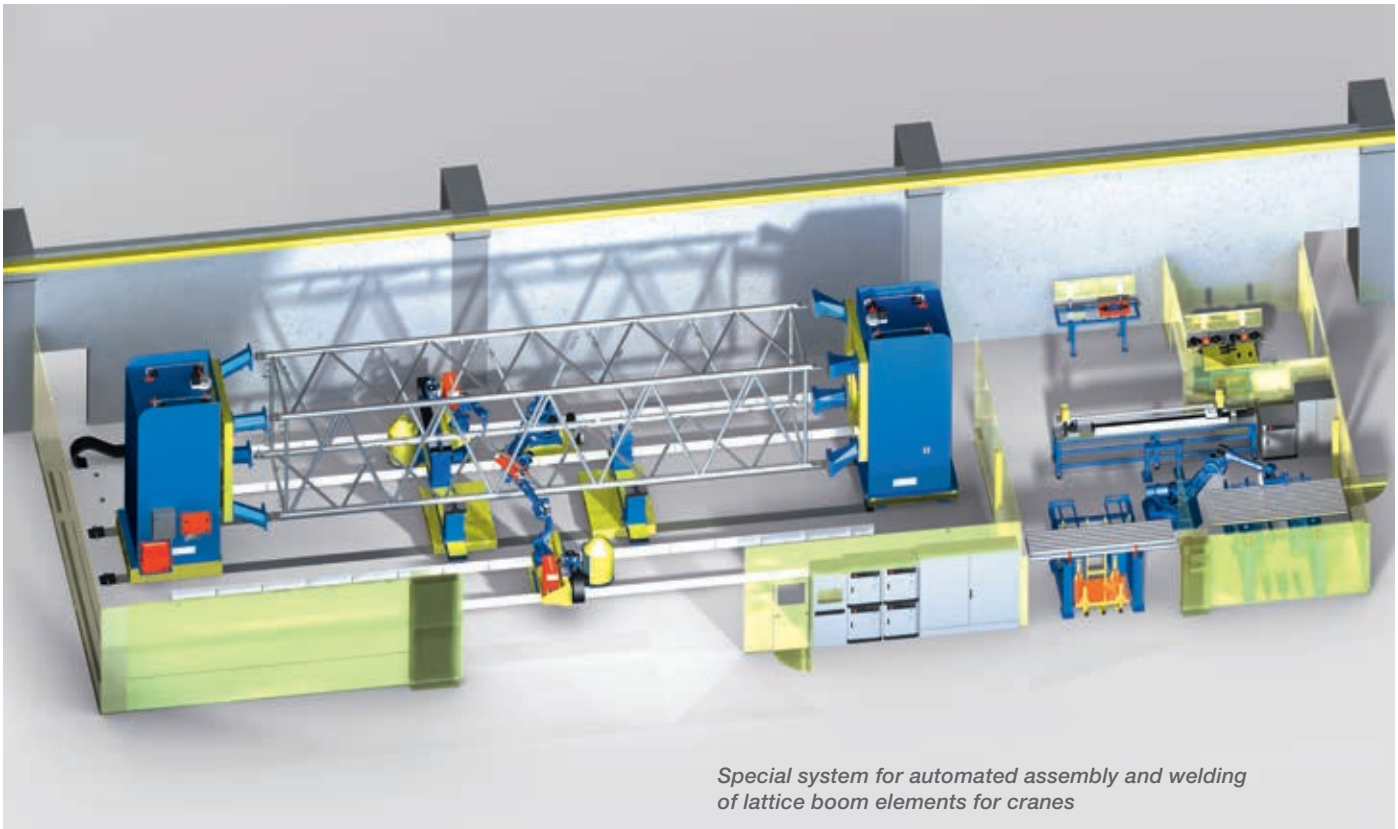


Special design: 5-axis positioning table with steady rest system for machining the end faces of long work pieces, in this case fuel tanks for trucks: welding of cover/bottom with tank casing



Special solution for automated MSG welding of 50 tractor cabs per day

Three-axis gantry system for welding industrial heat exchangers



Special system for automated assembly and welding of lattice boom elements for cranes

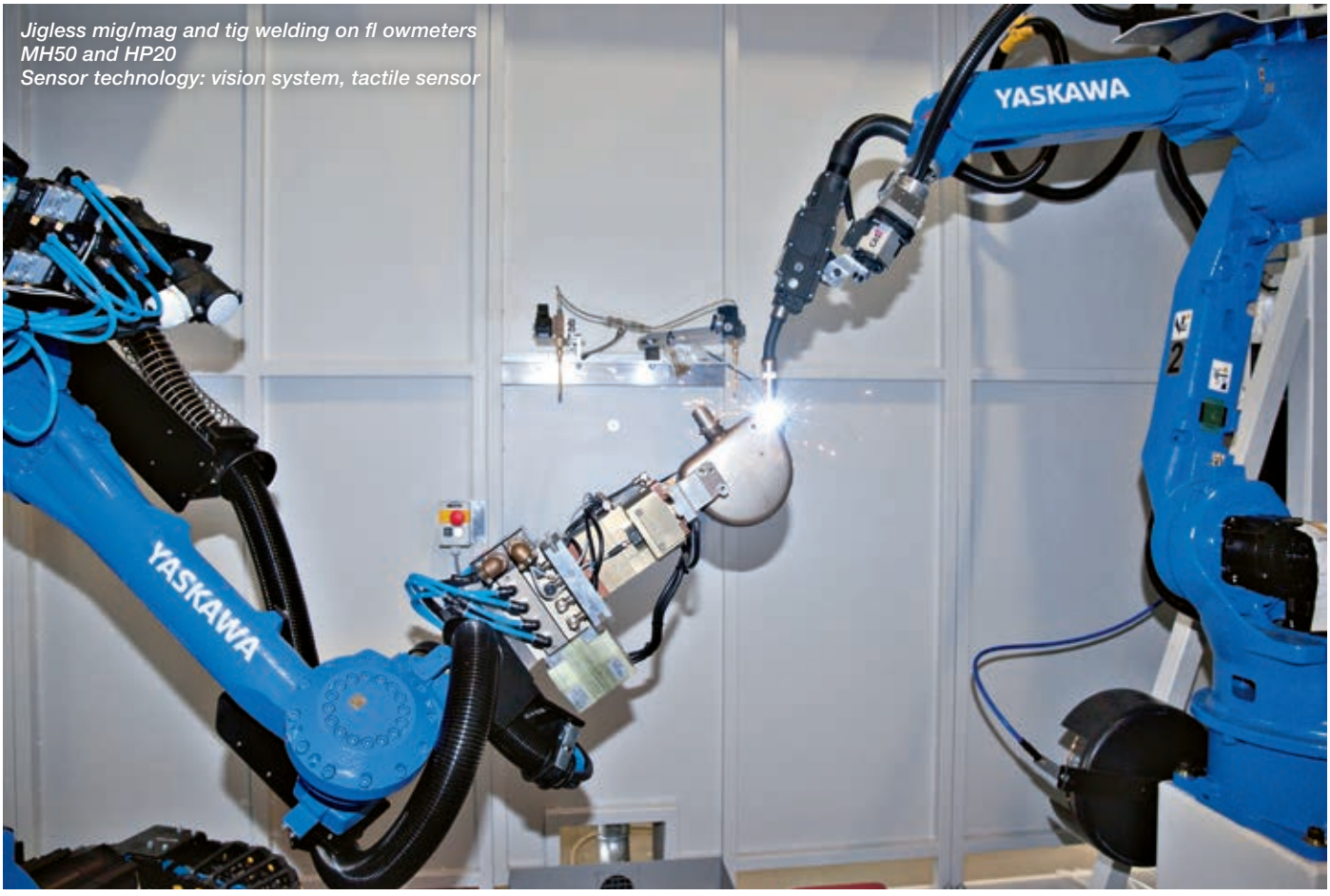
YASKAWA: Your Specialist for Jigless Welding with Sensors

Another example of networked production scenarios is jigless robotic welding, which is doubtless one of the most challenging disciplines in the automation sector. By dispensing with the clamping and tack-welding of work pieces, jigless processes offer significant advantages, but also place great demands on the robotic technology and the expertise of suppliers and users.
But what production manager wouldn't jump at the opportunity of being able to produce in "batch size 1" without having to convert systems during an unmanned shift? While such wishful thinking might have appeared totally unrealistic in the past, we can now produce multiple references testifying to the fact that we now do precisely that. And the number is constantly increasing as our experience curve continuously climbs and our robot technology opens up ever more possibilities.
The technology of allowing multiple robots to work with a single controller ("cooperating robots" – currently up to 8 robots possible) in conjunction with intelligent sensor systems and a laser camera system newly developed at YASKAWA, that can be controlled via the robot, enables the robots to see.

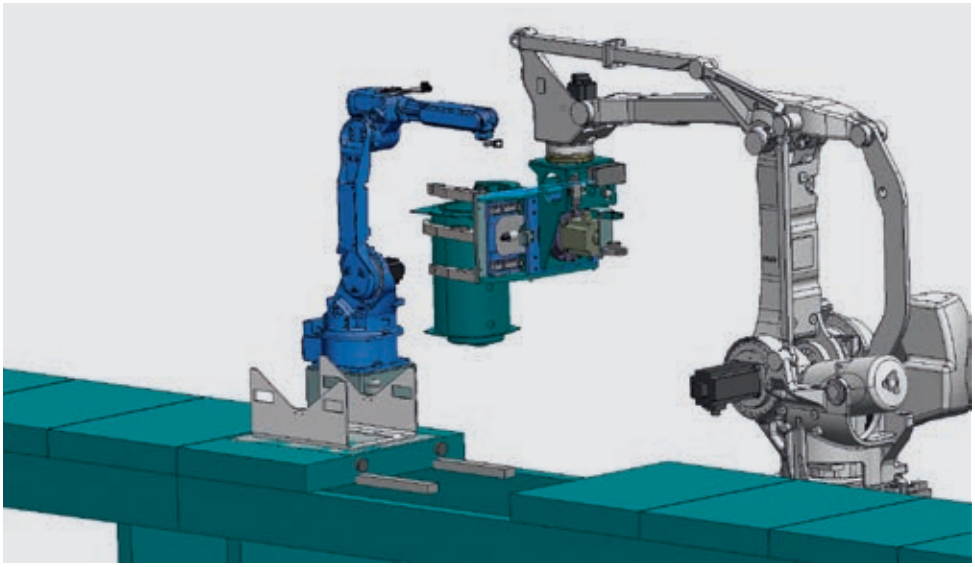
(Source: Sepp Hautzinger, Sales Manager YASKAWA Europe GmbH).

The following are just a few of our customers who have convinced themselves of the advantages of this technology under production conditions:

- **Atec-Weiss**
- **Bette**
- **Daimler AG**
- **Doka**
- **Emerson**
- **Hoval**
- **HQM**
- **Jungheinrich**
- **Kubota**
- **Pöttinger**
- **PWO**

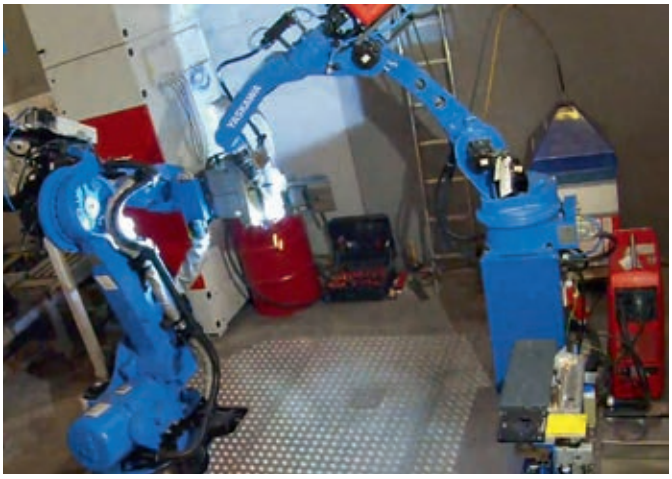


Jigless mig/mag and tig welding on fl owmeters MH50 and HP20
Sensor technology: vision system, tactile sensor

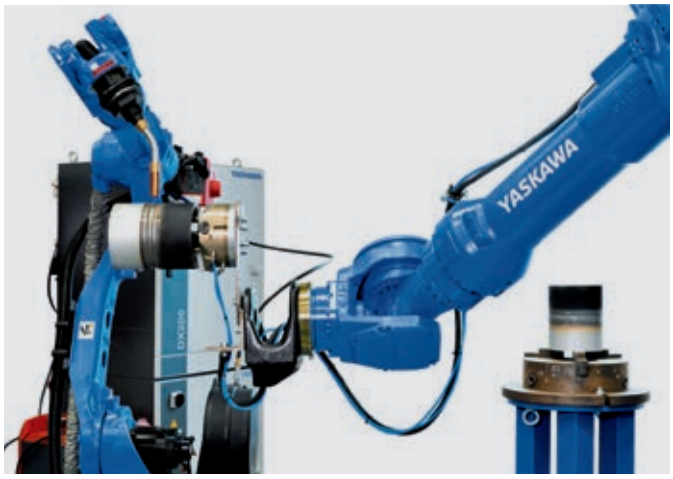


Unmanned MAG welding
on large heat exchangers
MPL800 with HP20
Sensor technology: tactile sensor
and through-the-arc sensor

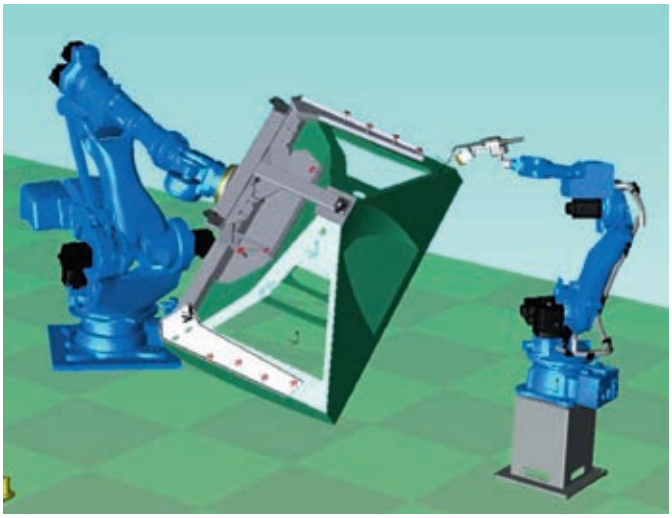
Highest flexibility for welding a wide range
of different subassemblies
with the ES280D II handling robot and MH24 welding robot
Sensor technology: MOTOSense SeamFinder and tactile sensor



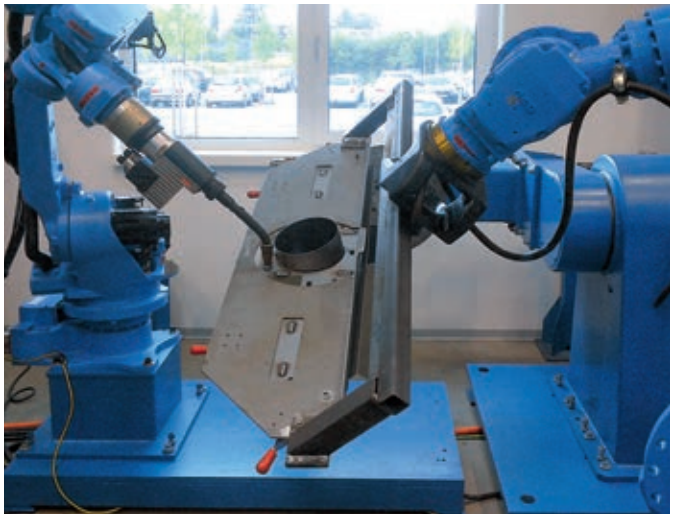
Flexible Multi-Robot system for demonstration, testing
and training purposes at the Application Center in Allershausen
MH225, 2x MA2010 and turn-tilt positioning table
Sensor technology: tactile sensor and arc sensor



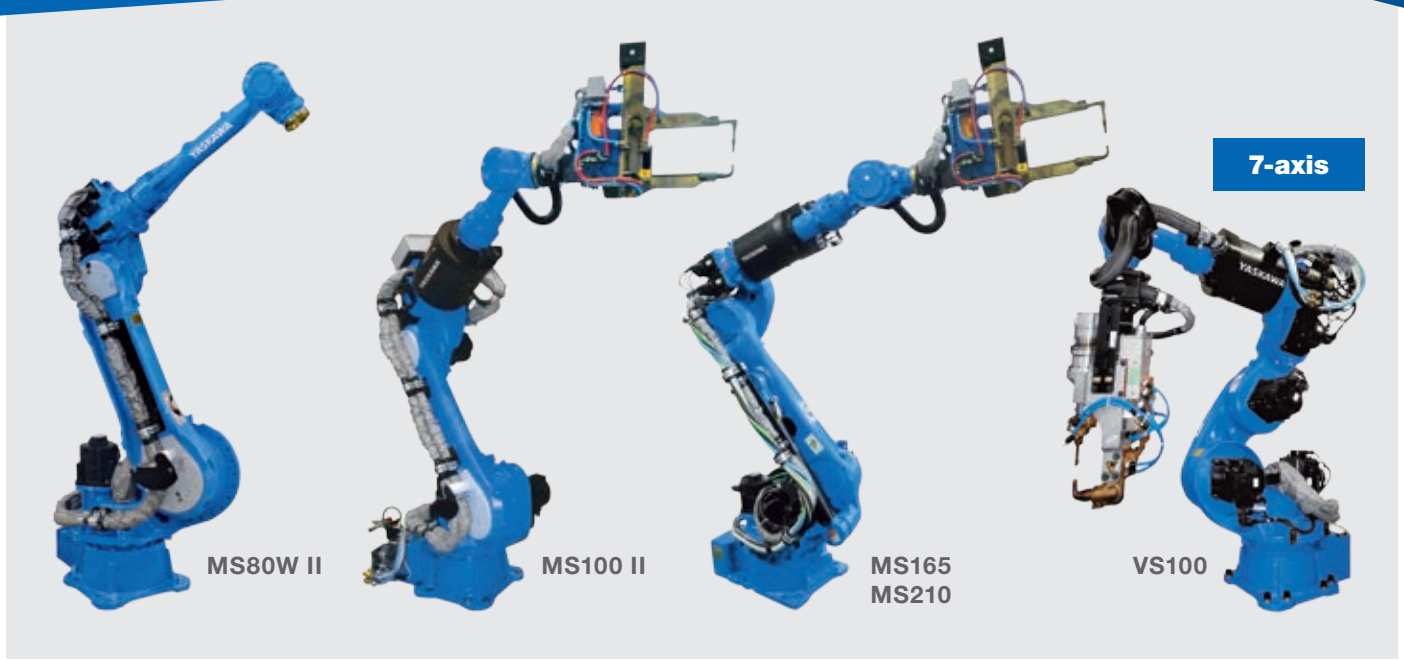
MAG welding on bulk material containers
MH400 with MH50-30
Sensor technology: vision system, MOTOSense SeamFinder
and tactile sensor



MAG welding on various housing components and subassemblies
ES165 with MA1800
Sensor technology: tactile sensor and through-the-arc sensor

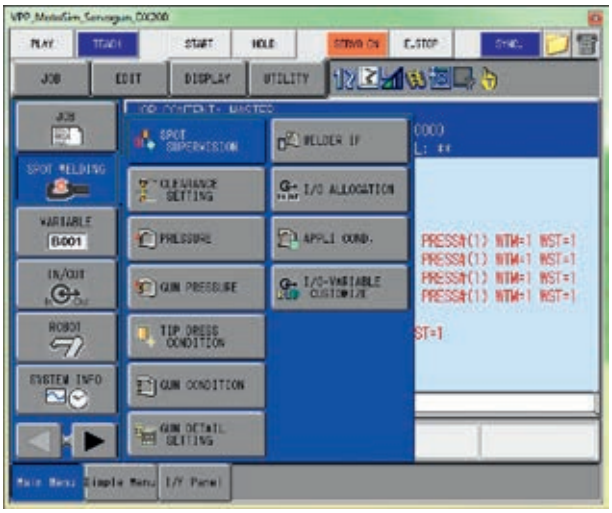


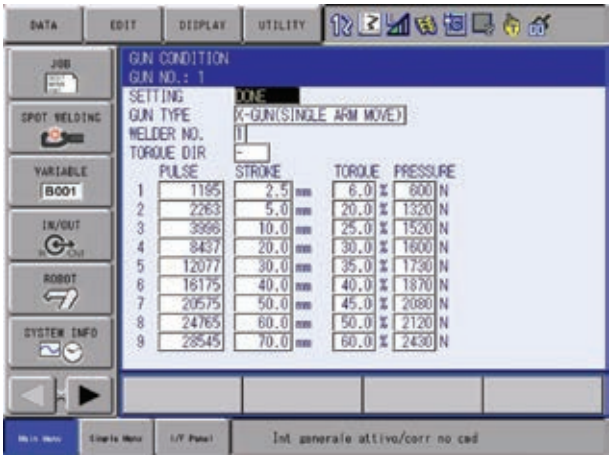
Resistance Spot Welding



As one of the leading manufacturers of spot welding robots, YASKAWA offers numerous models covering a wide range of payloads and reaches. In cooperation with our OEMs, we have developed innovative robots and solutions, e.g. to improve vehicle body production.

The 7-axis MOTOMAN VS100 stands out due to its uniquely streamlined design, which is perfectly suited to applications in the automotive sector. The VS100 is the first 7-axis robot in this industry and offers a highly flexible working envelope. It can work close to work pieces and other robots and thus enables flexible and space-saving cell and system layouts.





Robots:

- **MS80W II** (max. payload 80 kg, reach 2236 mm)
- **MS100 II** (max. payload 110 kg, reach 2236 mm)
- **MS165** (max. payload 180 kg, reach 2702 mm)
- **MS210** (max. payload 225 kg, reach 2702 mm)
- **VS100** (max. payload 100 kg, reach 2236 mm)

Software & Special Functions

- **Spot welding SW**
- **3D layout**
- **Simulation cycle times**

Examples of Suppliers:

Spot Welding Guns (Servoguns / Pneumatic Guns)

- **Own products from yasKaWa italy**
- **ARO**
- **Düring**
- **Nimak**
- **OBARA**



Controller

- **Bosch Rexroth**
- **Harms & Wende**
- **Matuschek**



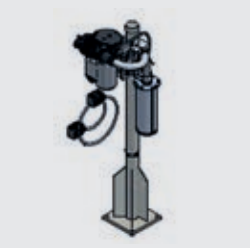
Hosepacks

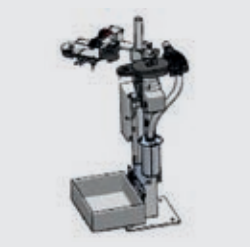
- **LEONI**
- **Sumcab Becker**



Tip Dresser / Tip Dresser Modular System

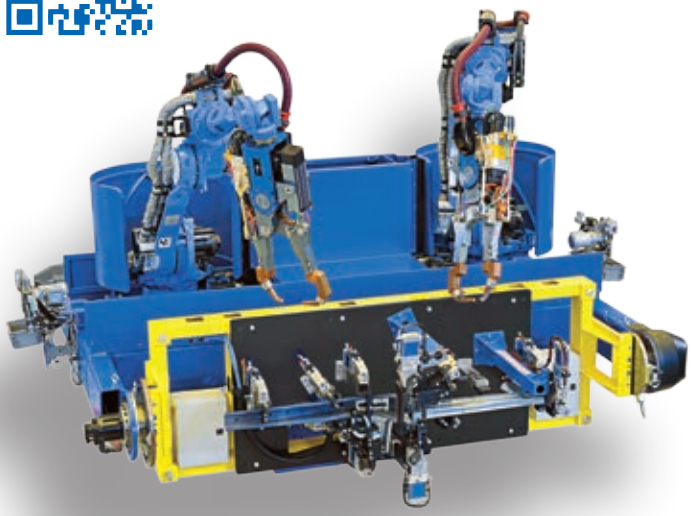
- **Bräuer**
- **Obara**
- **Sinterleghe**



Spot Welding Systems

From Robot to complete Solution



Turnkey Process

- Analysis of the specifi cations
- Pre-design and drafting of the proposal
- Simulation and Layout of the solution
- Traceability and Lean Manufacturing
- Short-time production
- Line assembly and installation
- Testing and Inspection
- Maintenance and spare parts in time and worldwide

Industrial Solutions

The success of an idea comes from an approach that undermines tradition.

The success of an idea comes from an approach that undermines tradition. YASKAWA took the opportunity to see beyond the robot, being sure of the high quality of the product, and create a complete spot welding solution.

The corporate know-how has put the company fully revamped on the Automotive market. Today, Yaskawa is able to design, build, install and service robotized lines that meet the highest standards in terms of technology and innovation.

KEY BENEFITS

- **Compact solution**, save space up to 40 %
- **Improved accessibility** to the parts to be welded
- **Easy to move**, consists of a single block
- **Easy to install**, no re-teach on site
- **Reduced set-up by the customer**, no re-teach on site
- **Easy to program**, ergonomic position for the operator
- **Flexible concept** – high versatility from one product to another
- **“Robot on board” in frontal position**, easily unloading of the item without interference
- **Faster than ever**, save cycle time

The best selling and most demanded Spot Welding Robots

MOTOMAN VS-series

VS100

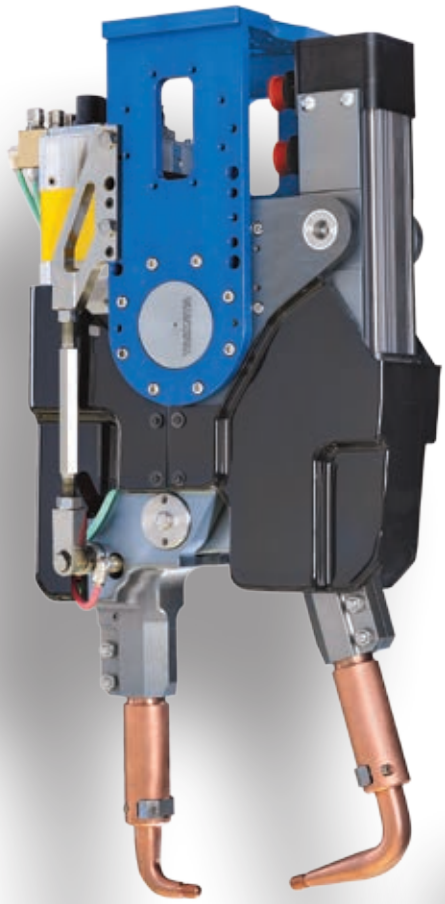
MS80W II

MOTOMAN MS-series

MS165

MS210

Spot Welding Gun Range

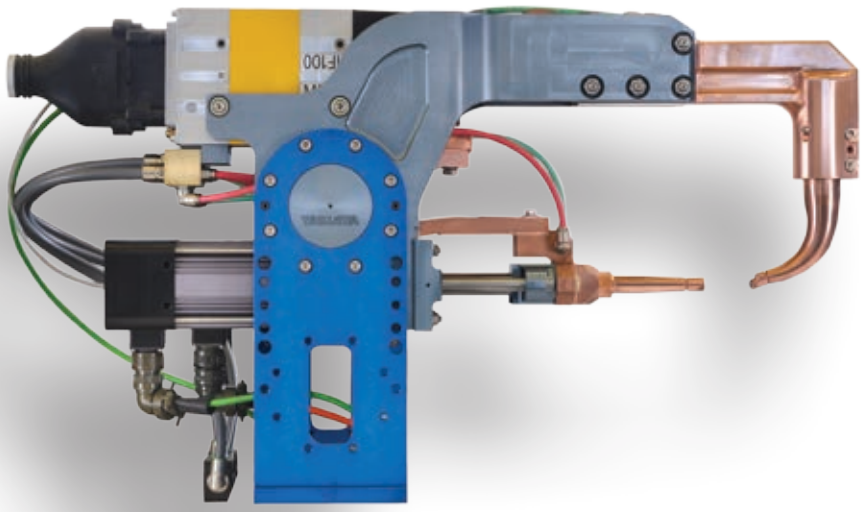


The new range of spot welding guns was developed by YASKAWA and has an extremely low weight. Carefully designed down to the smallest detail, it allows you to use robot with lower capacity.

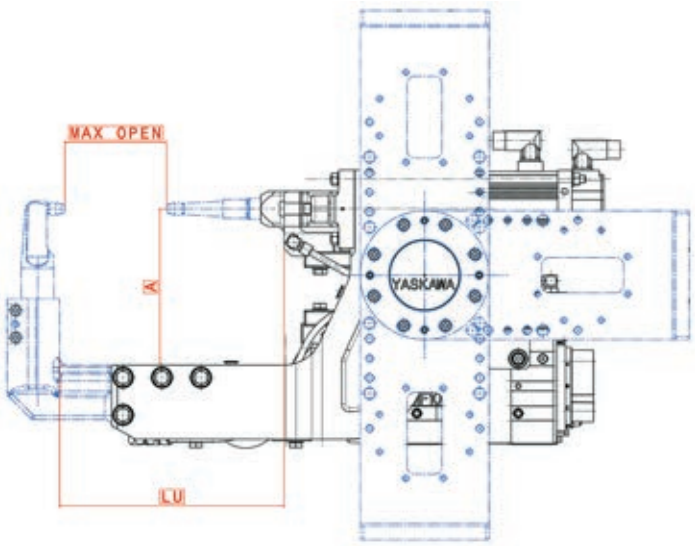
These features allow us to make a wide range of guns with different openings, reach and wrist mounting, depending on the item to be welded.

KEY BENEFITS

- No pneumatic system
- It consists of three components (gun body, transformer and motor) for maximum simplicity of the structure
- The cables can be connected sideways to ensure better rotation of the wrist of the robot
- Lower energy consumption
- Can be mounted on a robot with lower weight
- Easier to install
- Standardization of the gun with greater customization options starting from the standard solution



Gun C

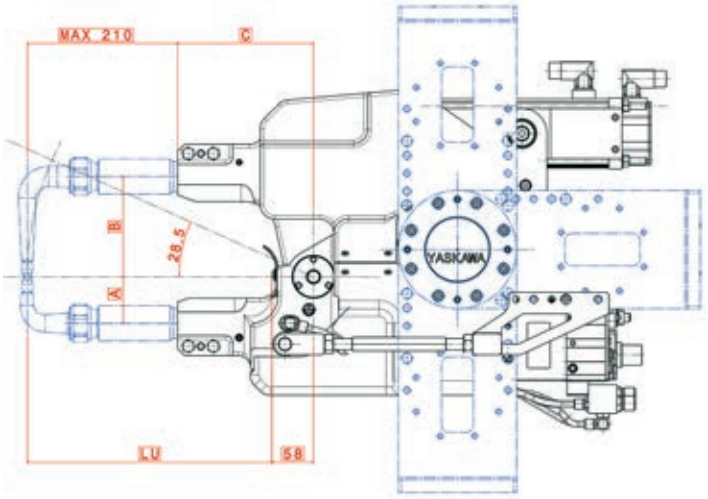


Arm center distance		
A	200	300

LU Usabele opening [mm]	Electrode force Max. load [daN]	Max. opening Max. open [mm]
250	450	130
300	450	130
350	450	130

Possible combinations (family size)	
Gun	A
BGJ-200	200
BGJ-300	300

Gun X

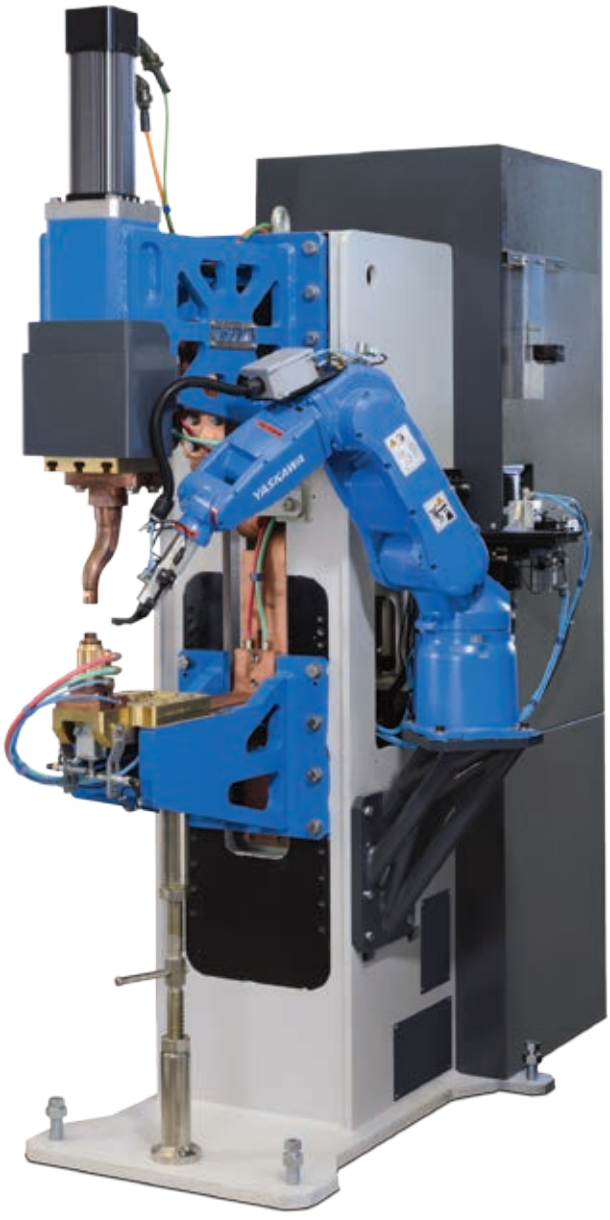


LU Usabele opening [mm]	Electrode force Max. load [daN]		Max. opening Max. open [mm]
250	530 (C = 190)	N.O. (C = 290)	144
300	500 (C = 190)	N.O. (C = 290)	167
350	450 (C = 190)	500 (C = 290)	190
400	380 (C = 190)	450 (C = 290)	214
450	320 (C = 190)	380 (C = 290)	238

Arm center distance and length			
A	64	125	150
B	100	140	250
C	190	290	–

Possible combinations (family size)			
Gun	A	B	C
BGX-65-100-190 BGX-65-100-290	65	100	190 / 290
BGX-65-140-190 BGX-65-140-290	65	140	190 / 290
BGX-65-250-190 BGX-65-250-290	65	250	190 / 290
BGX-125-100-190 BGX-125-100-290	125	100	190 / 290
BGX-125-140-190 BGX-125-140-290	125	140	190 / 290
BGX-125-250-190 BGX-125-250-290	125	250	190 / 290
BGX-150-100-190 BGX-150-100-290	150	100	190 / 290
BGX-150-140-190 BGX-150-140-290	150	140	190 / 290
BGX-150-250-190 BGX-150-250-290	150	250	190 / 290

Nut Welding Machine



The nut welding machine is the new machine designed and manufactured

by YASKAWA for completing the welding process. It consists of a welded structure, adjustable in different positions and with higher head.

On the right or left side of the machine, depending on your needs, you can mount the handling robot MH5 with support attached to the structure and a unit for servicing the item to be welded (nut/bushing/pin).

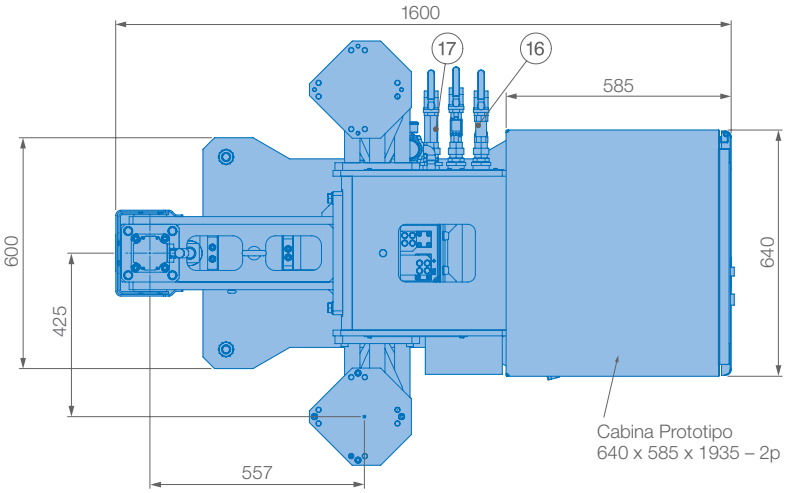
Specifications

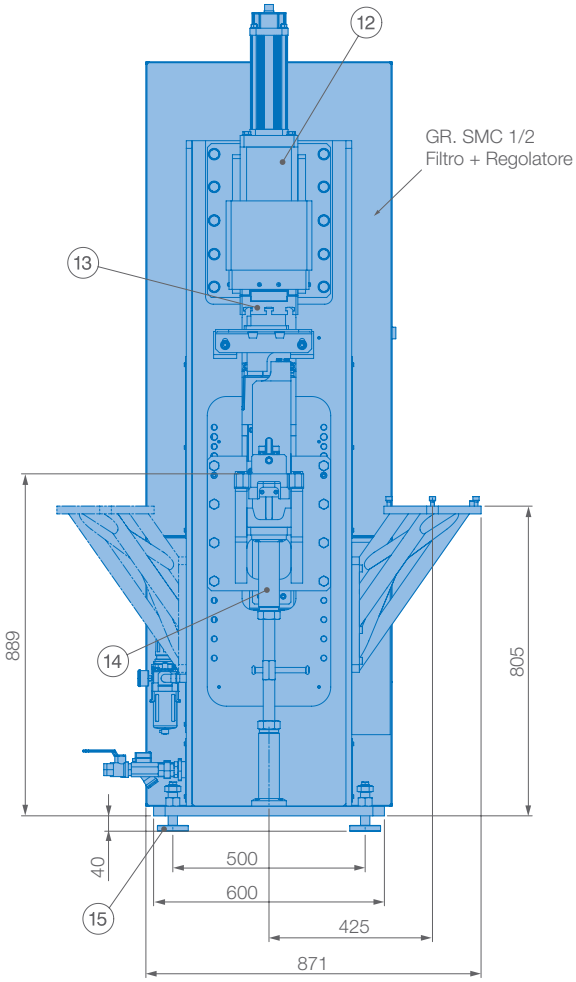
Between the workbench and the top head is mounted a tool dedicated to item welding. To the back of the structure is installed a cabinet containing a vibrator that allows you to select the item to be welded, to control the handling robots and the timer of the transformer. The items to be welded are loaded into the vibrator and conveyed, by vibration, near the service unit. When the item is brought in position, it can be picked up by the handling robot that places it on the tool on which the sheet metal item is already present. The servo-motor brings the moving part of the tool into contact with the item that is in contact with the sheet metal item. Through pressure and current fl ow, the indents of the item (nut/bushing/pin) are melted with the sheet metal item.

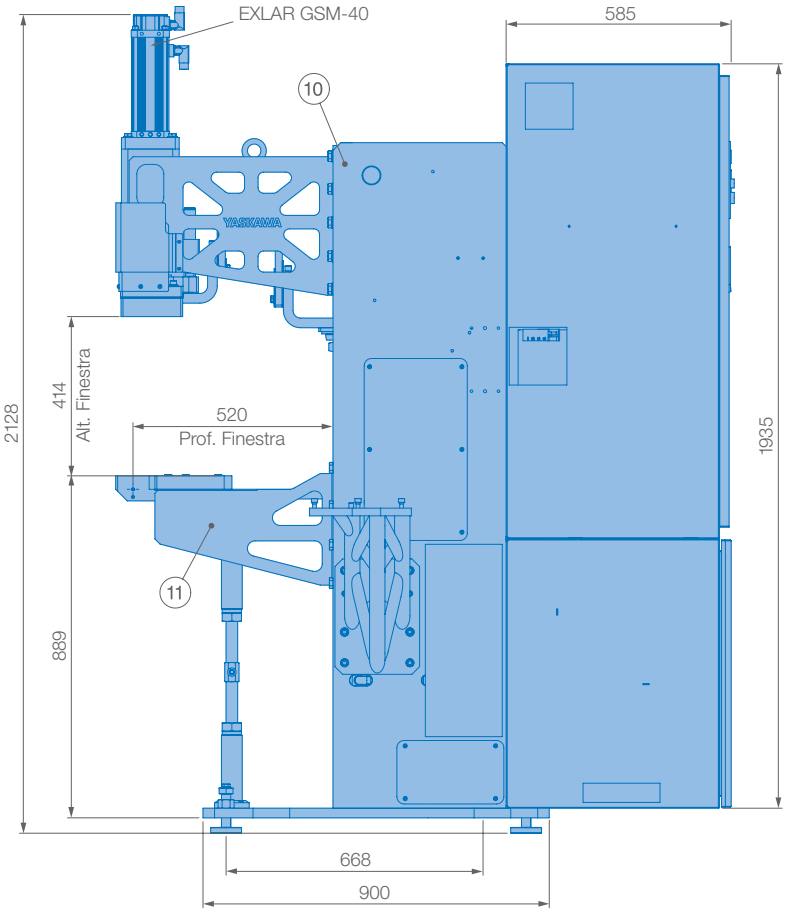
KEY BENEFITS

- Autonomy, thanks to the integration of its elements
- Greater performance and reliability
- Immediate maintenance
- Quick set-up when changing the item

Nut Welding Machine







Specifications			
machine type	SF YASKAWA	**min. opening between the board**	400 mm
Supply voltage	400 V – 50 Hz	**top board size (3 grooves)**	150 x 150 mm
Secondary voltage	9.3 V (with no load)	**Bottom board size (customized)**	150 x 150 mm
Short circuit current intensity	39 KA	**Water pressure**	0,3 – 0,6 Mpa
Auxiliary supply voltage	220 V-AC / 24 V-CC	**Water consumption**	13 l/min.
Conventional power at 50 %	85 kW	**Air consumption (m^3 for 100 points at 0.4 mpa)**	1,4 m^3
min. force on electrodes	250 daN	**Welding control**	CS-I 700 A
max. force on electrodes	1000 daN	**SCR unit**	SAFCO
SF axis usable depth	500 mm	**Weight**	950 kg
mobile electrode stroke	130 mm	**Height**	2128 mm
lower shelf adjustment stroke	200 mm	**minimum-maximum width**	640 – 870 mm
max. opening between the boards	600 mm	**Depth**	1600 mm

Dressing Kit

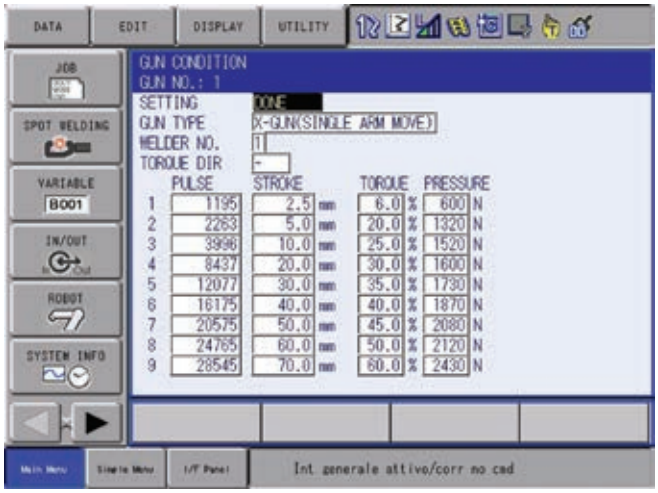
- Spot Welding gun wiring from robot base to wrist – 35 mm² power cord, water pipe PUR 12, motor, encoder, signal cables
- Spot Welding connection from robot base to DX200 controller (length 10 metres) – 2 pipes PUR 12, power cord 35 mm²

Welding Cabinet

- MF inverter with 36 kA for water-cooling
- Auto-Adaptive SD card (optional)
- Profi bus or Profi net card
- Ethernet card
- Cabinet h = 600 mm
- Main switch 160 A
- Power contactor
- Contactor and switch kit for dressing unit control
- 24 V-DC power supply

Motorgun Software

Communication software for the welding timer and the gun motor guarantees a high quality welding process due to integration and complete dialogue between all items managed as a unique YASKAWA brand product.



- Easy to set up: a few steps to confi gure communication with the welding timer
- Easy to set calibration, confi guration page dedicated to calibration of gun and motor
- Contains functions that enable self-learning

Laser Applications

Laser Cutting/Laser Welding


MC2000 II

These processes enable cutting and welding of complex 3D shapes on almost all kinds of work pieces.

The outstanding path accuracy achieves precise results within higher fl exibility than many other cutting devices. A YASKAWA robot system can be used for several applications like cutting, welding or fi nishing. This opens further possibilities to reduce complete cycle times and speeds up the return of invest.

Robots:

- **MC2000 II** (max. payload 50 kg, reach 2038 mm)
- **MH50 II** (max. payload 50 kg, reach 2061 mm)
- **MH80 II** (max. payload 80 kg, reach 2061 mm)
- **MH110** (max. payload 110 kg, reach 2236 mm)
- **MH180** (max. payload 180 kg, reach 2702 mm)

Suppliers:

Laser welding units

- **II-VI HighYag**
- **Precitec**
- **Scansonic**

RLW units

- **Blackbird – SCANLAB**
- **Highyag**
- **Trumpf**

Laser beam sources

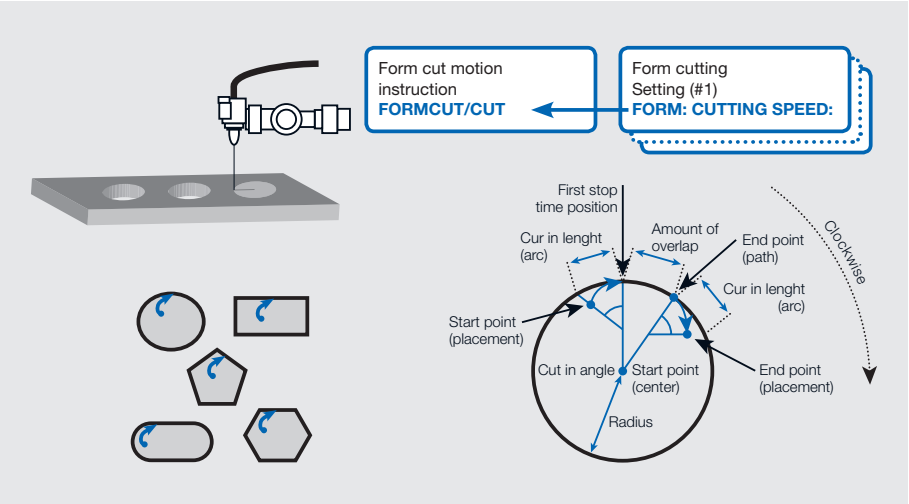
- **IPG**
- **Trumpf**

Customers:

- **Benteler**
- **Eberspächer**
- **Tenneco**
- **Trumpf**

Software Function

Form Cutting



The form cutting function allows a quick and comfortable access to simple geometric figures which are stored in preconfigured files.

Laser cutting cell: 50 kg robot on gantry track

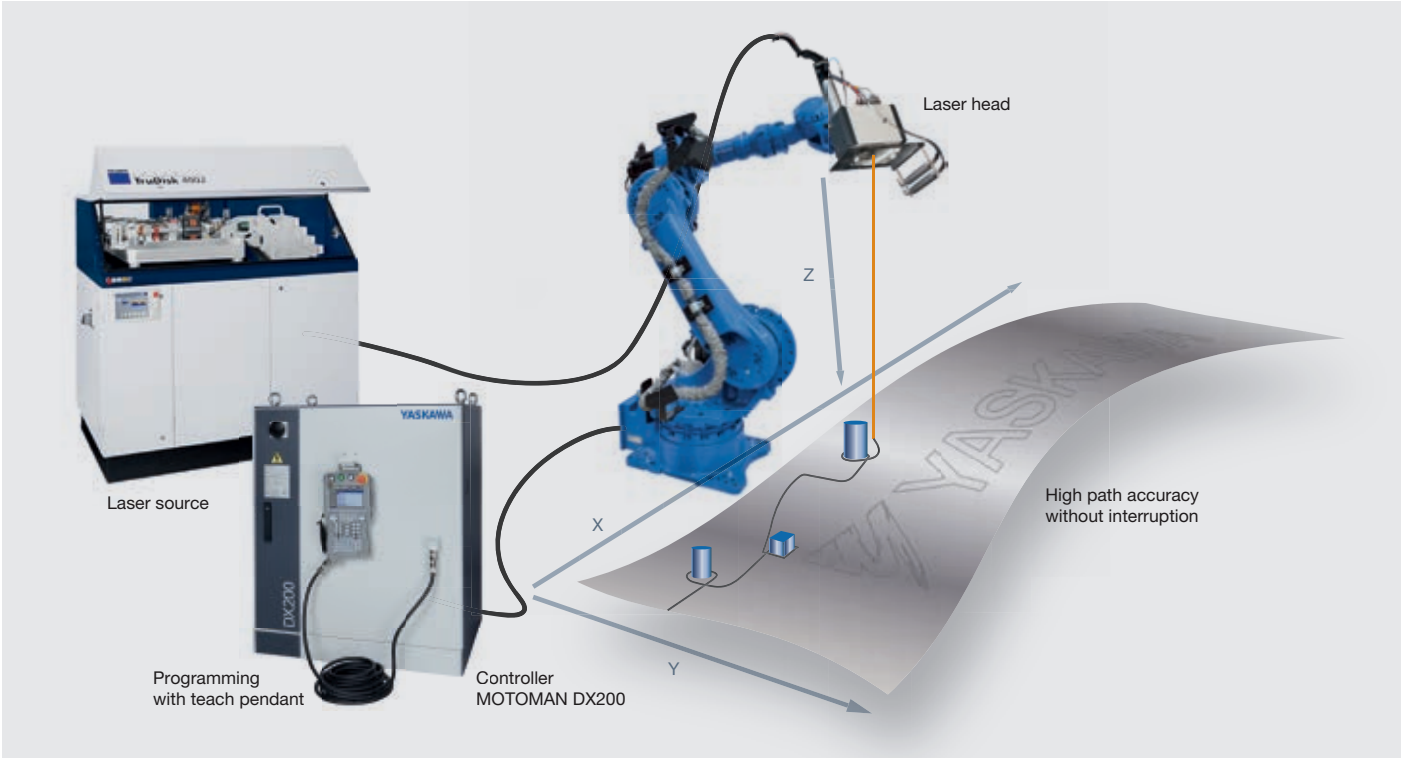
»Real Welding on the Fly«

MOTOMAN MC2000 II with laser heads from Highyag, Trumpf or BLACKBIRD.

the new standard for precision in laser welding.

Pinpoint Precision, even in Curves!

Principle of »Real Welding on the Fly«



- A laser source sends a laser beam through a fibre optic cable to the laser head
- Two mirrors in the laser head deflect the laser beam in the x and y directions along the desired welding contour
- Positioning in the z direction (distance from the work piece) is carried out using special focusing optics in the laser head
- The robot moves the laser head along the programmed path at a distance of approx. 50 cm above the work piece. The path can be linear or variable
- The controller (DX200) synchronise the robot motions and, in the case of systems from TRUMPF or HIGHYAG, also the motions of the mirrors and optics in the laser head
- The freely-defined path of the robot and the positions and shape of the weld seams are programmed via the teach pendant of the MOTOMAN DX200
- One unique feature is that the robot can be repositioned during the welding operation

The Result:

- Increased productivity with high-speed laser welding (up to 8 m per minute) and time savings of up to 70 % compared with welding with fixed optics
- High flexibility – particularly suitable for work pieces with complicated geometry
- Circular or complicated curve paths can be welded in one go and without interruption
- High system stability due to non-contact process with low interference

A MOTOMAN Robot makes the Difference!

Laser technology is regarded as a driver of innovation in a wide range of applications, such as welding, cutting, build-up welding or marking, and opens up new ways of boosting efficiency. In order to make robotic laser applications even more effective and economical, YASKAWA has developed a new robot – the MOTOMAN MC2000 II – that features intelligent interfaces with laser scanners from leading manufacturers, enabling it to exploit its potential to the full.

Control Variant Combinations

Choose the Solution that best meets your Requirements.

The Multi-Robot function launched back in 1994 meant that YASKAWA was able from an early stage to control up to 8 robots or 72 axes with a single controller. This know-how has still never been successfully imitated and, combined with the new high-precision MOTOMAN MC2000 II robot, it opens up new possibilities for in remote laser welding.

The interface to laser heads from Trumpf and Highyag makes it possible to program motions of the mirrors and optics in the laser heads directly using the teach pendant of the MOTOMAN DX200 controller. The Multi-Robot function ensures that the motions of the robot and the laser heads are synchronised and that no repositioning is required during the welding process. External axes, such as tracks and positioners, can naturally also be synchronised via the MOTOMAN DX200 controller.

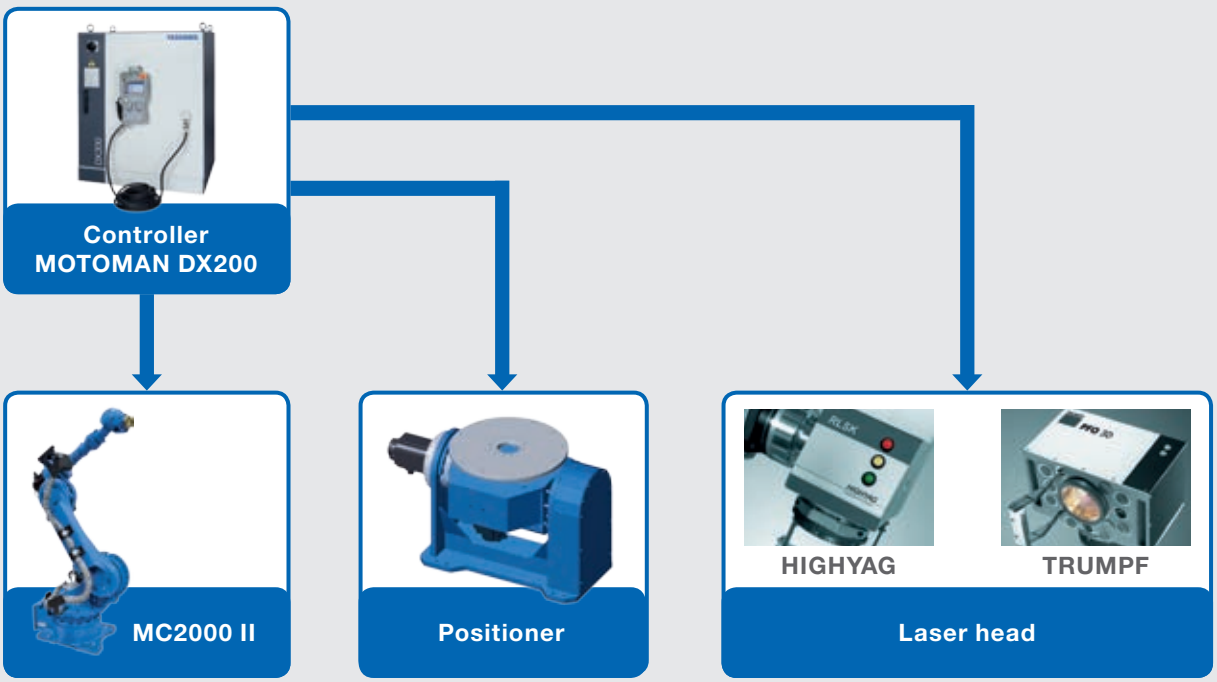
In combination with a BLACKBIRD laser head, the programming is carried out in a Blackbird controller, while the precise path calculations remain the task of the MOTOMAN controllers.

Both combinations have a common objective: accurate results, faster throughput times and greater cost-effectiveness of the system.

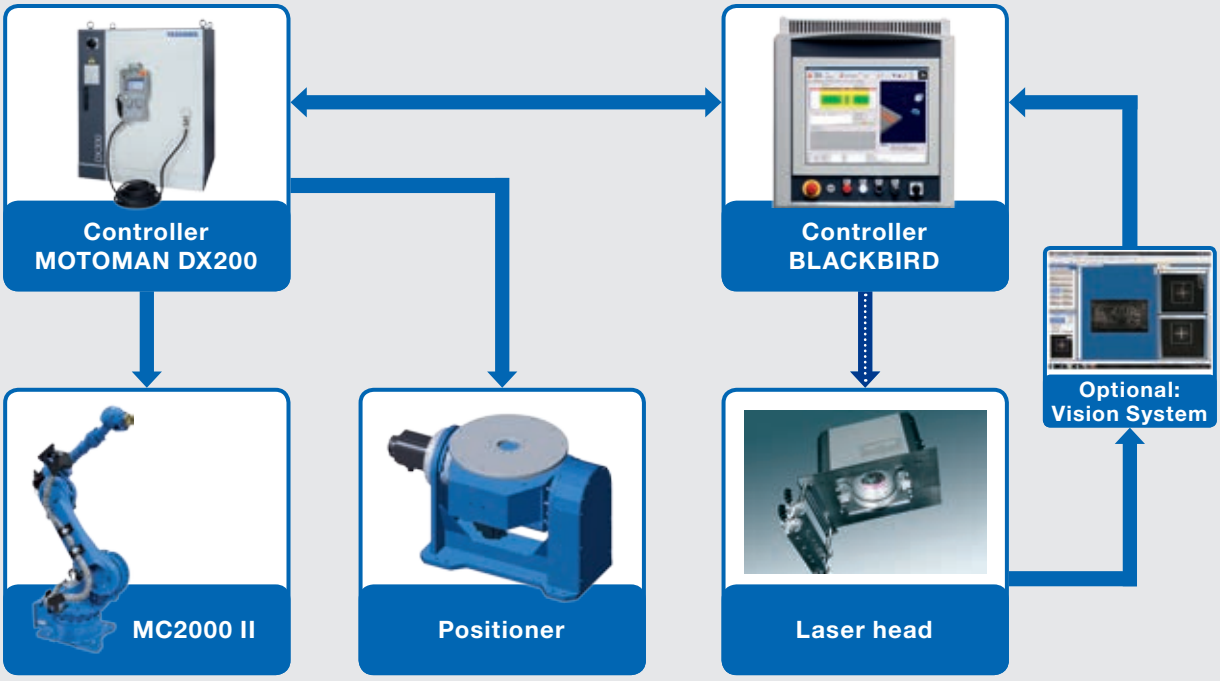
KEY BENEFITS

- Greater cost-effectiveness of your system
- Simple programming of robot and laser head via the teach pendant of the robot controller
- Synchronised motions of the robot and the optics and mirrors in the laser head
- No need for repositioning of the laser head during the welding operation
- Throughput times for the welding process are reduced
- If required, turnkey systems from a single source

System Controller with MOTOMAN DX200

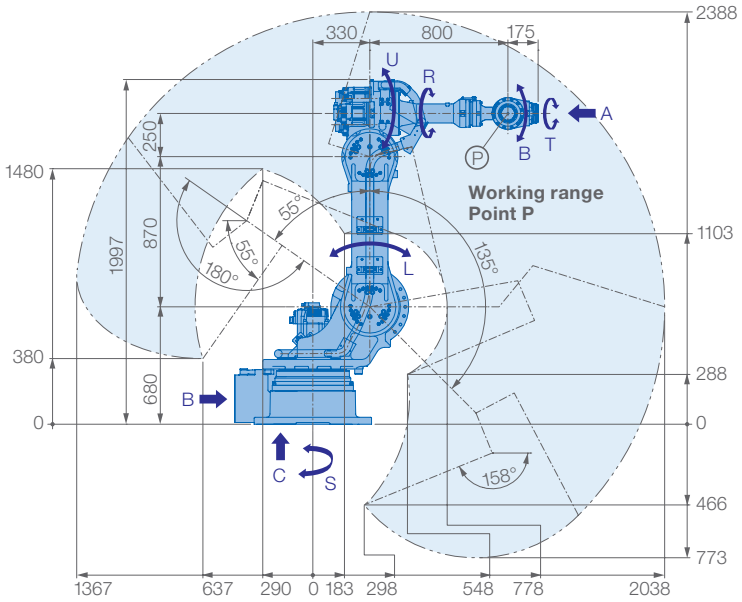


System Controller with BLACKBIRD and MOTOMAN DX200



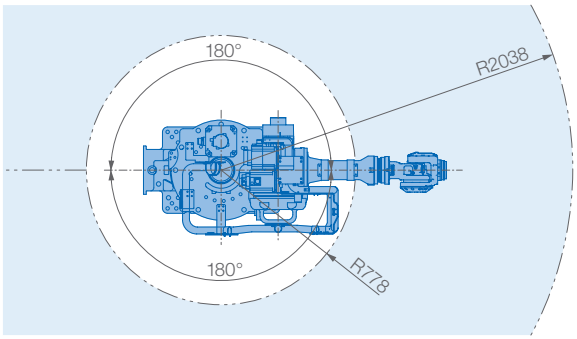
The new MOTOMAN MC2000 II and the proven Controller DX200 provide clear benefits – precision, synchronisation and reliability.

The “Master Cut”, the versatile, powerful MOTOMAN MC2000 II robot is designed with high rigidity and precision drives to provide superior path accuracy for laser cutting small holes and sharp corners. The slim base, waist and arm allow this robot to be placed close to work piece holding fi xtures to improve part accessibility. Fast axial speeds and acceleration reduce cycle times and increase production output. The compact design and advanced collision avoidance features, including brakes on all axes, with multiple robot control allow up to eight robots (72 axes) to be used together to maximise productivity while minimising fl oor space requirements.



KEY BENEFITS

- Compact, powerful and accurate
- High payload of 50 kg enables easy using of a variety of laser heads
- Cutting and welding of various automotive parts by maximum reach of 2038 mm
- Possibility of using up to eight robots (72 axes) together
- Fast axial speeds and acceleration increase productivity



Specifications MC2000 II						
Axes	Maximum motion range [°]	Maximum speed [°/sec.]	Allowable moment [Nm]	Allowable moment of inertia [kg · m²]	Controlled axes	6
					Max. payload [kg]	50
S	±180	150	–	–	Repeatability [mm]	±0.07
L	+135/–90	150	–	–	Max. working range R [mm]	2038
U	+235/–158	150	–	–	Temperature [°C]	0 to +40
R	±360	250	110	7	Humidity [%]	20 – 80
B	±125	250	110	7	Weight [kg]	845
T	±360	250	55	1	Power supply, average [KVA]	3.5

YASKAWAs new next-generation DX200 controller features robust PC architecture and system-level control for robotic work cells. Using patented multiple robot control technology, as well as I/O devices and communication protocols furthermore it provides built-in ladder logic processing including 4,096 I/O addresses, a variety of fieldbus network connections, a high-speed E-server connection and I/F panels (10) which shows the HMI on the pendant.

It often eliminates the need for separate PLC and human machine interface (HMI) and delivers significant cost savings at system level, while decreasing work cell complexity and improving overall reliability. Dynamic interference zones protect the robot arm and provide advanced collision avoidance.

The Advanced Robot Motion (ARM) control provides high performance, best-in-class path planning and dramatically reduces teaching time. It supports coordinated motion with multiple robots or other devices.

A small, lightweight Windows® CE programming pendant features colour touch screen with multiple window display capability. Programming features are designed to use minimum number of keystrokes and are facilitated by new function packages and more than 120 functions. Furthermore it conserves the power consumption from 38 % – 70 % depending on application and robot size.

It is available with the optional Category 3 Functional Safety Unit (FSU) and allows an establishment of 32 safety units and up to 16 tools.

Multi-Robot-Synchronisation function

Real time synchronisation of up to eight robots and external axes (max. 72 axes)

- Jigless working possible
- Enables high density robot layouts
- Reduced cycle time

Advanced Robot Motion Function (ARM)

Dynamic calculation of torque and loads on the robot axes

- Extremely high path accuracy
- Optimal robot motion and velocity
- Vibration control
- Highly sensitive collision detection

Functional Safety Unit (FSU) Category 3

- Multiple zones with inside and outside position monitoring
- Speed limiting and stand-still monitoring
- Multiple tool interference and angle checking

Communication

Ethernet, Web (ftp, opc) Server options and all common fieldbus systems

- Easy integration into existing networks
- Remote monitoring and diagnosis of robot systems

Additional benefits

- Multitasking
- Integrated PLC
- Highest performance due to industrial PC
- Boot time: max. 50 sec.
- MTTR (Mean Time To Repair): < 10 min.
- Automatic zero calibration
- Special function packages including more than 120 functions for a wide variety of applications

KEY BENEFITS

- Application specific function packages including more than 120 functions
- Optional category 3 Functional Safety Unit (FSU)
- High productivity
- Low integration costs
- Integrated cell control capabilities
- High reliability and energy efficiency
- Easy maintanance
- Simple programming
- Convenient compact flash slot and USB port facilitate memory backups

When Specialists combine Forces, 1 + 1 = 3

Depending on the specific composition of your plant, the systems offer different advantages.

Advantages of the Blackbird scanning solution with the MOTOMAN MC2000 II

The 3D scanning solution from Blackbird, a subsidiary of Scanlab AG, the market leader for scanning systems, allows flexible and highly efficient remote processing of welding tasks. The path accuracy and precision of the MOTOMAN controller are seamlessly united with a highly dynamic 3D scanning solution.

BLACKBIRD Intelliweld 30 FC

Optics: Scanlab Intelliweld 30 FC

- Utmost dynamic performance and precision with automatic self-calibration
- Typical workspaces, e.g. 450 x 450 x 200 mm³
- Laser power up to 8 kW, comprehensive safety monitoring
- Integrated teaching support, configurable Crossjet
- Unique interfaces for image processing and process monitoring – including an automatically repositioned camera port that enables focused observation throughout the entire scan volume (opt.)

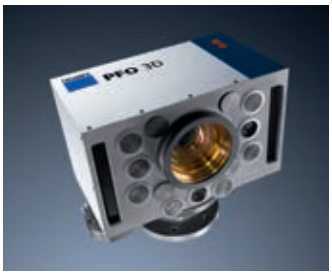
Scanner controller: Blackbird RobotSyncUnit

- Intuitive programming using the “teach-in” method or 3D CAD (DXF, STEP, IGES)
- Highly flexible parameterisation (power characteristic, oscillation, defocus, pulsing, etc.)
- Assistance function for cycle time optimisation and simulation
- High-speed interface for external correction values (opt.)
- Solution packages for automated seam position correction (opt.)
- Offline environment for robot and scanner programming (opt.)

Advantages offered by the interface designed specially for laser heads from TRUMPF and HIGHYAG

- Direct programming of the laser head using the teach pendant of the MOTOMAN DX200 controller
- All motions of the robot, the optics and beam deflection mirrors in the laser head, are synchronised by the robot controller. High-precision path accuracy and processing of acceleration variables by means of “Advanced Tracking Control”

TRUMPF PFO 3D



3D laser welding without the need to move the focusing optics or the work piece: this is possible even in multiple planes with the PFO 3D programmable focusing optics. If the scanner motion of the PFO is combined with a robot motion, even large workpieces can be welded “on-the-fly” in just a few seconds.

- The maximum size is 695 x 1080 mm in an elliptical shape with a Z travel of up to ±475 mm
- Maximum laser power 8 kW
- The PFO 3D has extensive interfaces for “on-the-fly” applications

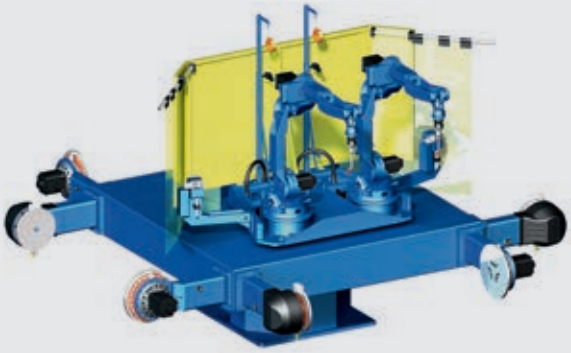
HIGHYAG RLSK

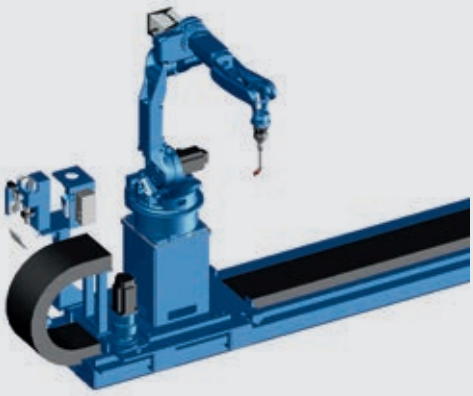
The free focus positioning in the three-dimensional working area of the RLSK from HIGHYAG enables “welding on the fly” during the robot motion.
This makes it possible to minimise the time between the weld seams and maximise the productivity of the manufacturing system. The unique optical design ensures a constant focus diameter with every change of the z focus position and thus reliable welding results.

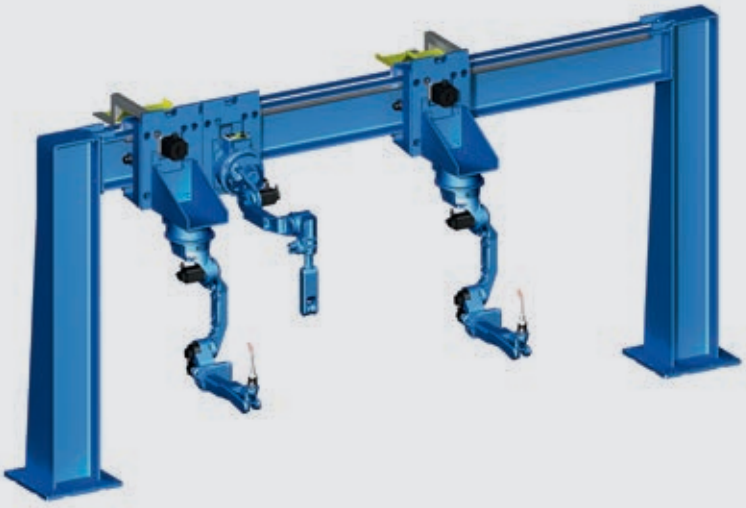
- The working area is 200 x 300 mm, z = ±100 mm
- Maximum average laser power 6 kW
- Highly efficient Crossjet and protective glass module incl. monitoring
- Camera or interface for process observation
- Integrated teaching support for exact positioning of the laser beam on three-dimensional work pieces
- Extensive information about the status of the laser head can be displayed via the robot controller or the high-performance HIGHYAG Studio software
- Fiber optic cable mounts: LLK-Auto, LLK-B, QBH

Further YASKAWA Products for Laser Applications

- Positioner
- Tracks
- Gantries







- MOTOMAN Robots of the MH-series

MH50 II

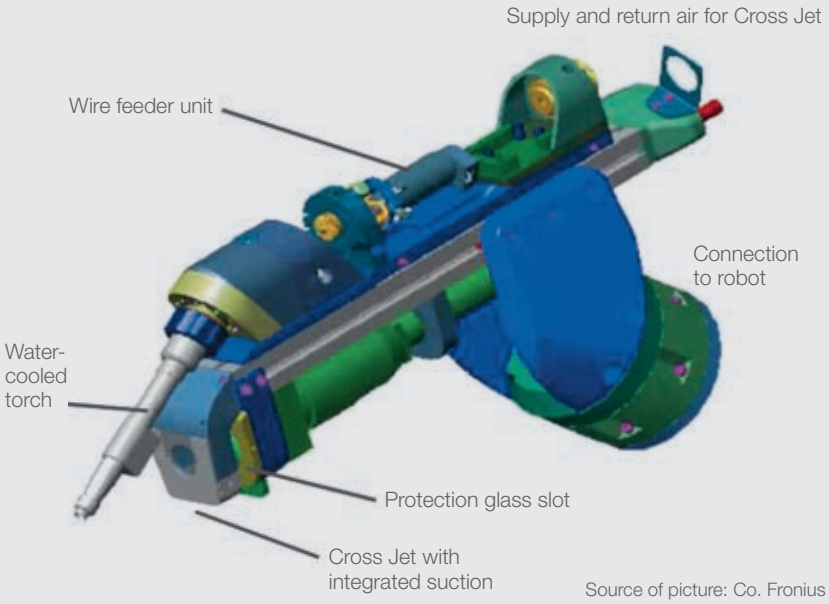
MH80 II

MH215 II

MH250 II

Laser Hybrid Welding

- For special tasks in steelwork
- Combining of laser welding with other welding processes, like MIG/MAG, TIG or plasma welding
- laser welding combined with MIG/MAG-welding:
  The laser generates high power intensity on a small focus for deep penetration. At the same time heat input and work piece distortion will be reduced by higher process speed. Gap bridging and closing the joint by filler wire with MIG-torch (faster than pure MIG-welding!)
- Combines advantages of MIG/MAG welding and laser welding at high deposition rate



Source of picture: Co. Fronius

Example for hybrid torch supplier: Co. Fronius

Suppliers:

Laser beam sources

- **IPG**
- **Trumpf**

Torches

- **Fronius**
- **Precitec**
- **Trumpf**

Customers:

- **Benteler**
- **Eberspächer**
- **Tenneco**
- **Trumpf**

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All dimensions in mm

Technical data may be subject to change without previous notice |
Please request detailed drawings at robotics@yaskawa.eu.com

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